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CIVIL WAR IRONCLADS

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The Dawn of Naval Armor

by

Robert MacBride

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To my father,
and to my sons, Alan and Andrew

The author wishes to thank the following persons for their assistance in the preparation of this book: Mrs. Lynford Hewitt, Miss Marlyn Radford, Mr. H. N. Lang, Mr. Stanley Grivensky, Miss Emily Marlin, Mr. Walter Andrews, and Mr. Martin Stevens.

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Foreword

The battle between the USS *Monitor* and the CSS *Virginia* (nee *Merrimack*), at Hampton Roads was neither the beginning nor the end of the story of the ironclad warships in the Civil War. Both the Union and the Confederate navies not only had other ironclad ships in commission at the time of the battle, they already had used them in combat. The months following saw the appearance of squadrons of monitors and casemate ironclads of the general design of the *Virginia*. It is with the sequels to the Battle of Hampton Roads that this book is primarily concerned.

Introduction:

Origins of the Ironclad

Although more than a century has elapsed since its beginnings, the conditions which gave rise to the ironclad warship were the same which later were to bring about the development of the dreadnought, the aircraft carrier, and the nuclear submarine: the responses of a burgeoning industrial technology to the demands of particular strategic requirements.

The ironclads, in fact, were among the very first products of the modern age of technology, along with the railroad and the telegraph, and they were unquestionably the first of the melancholy procession of modern tools of war. As such, they were a whole era ahead of any weapons in use ashore, save the revolver. The armies of the Civil War really differed relatively little from the armies of Marlborough, or even Cromwell, but even the crudest of the navies' armored vessels would have seemed familiar to a seaman of today.

The first contribution to the development of armored warships was most certainly the marine steam engine, which had been in use since about 1815 and, by the beginning of the Civil War, had reached a relatively high state of development, although it was used at that time only as a *primary* means of propulsion for riverboats and tugs. While essential to the creation of ironclads, the steam engine in no way dictated or forced their adoption; nor, for that matter, did the second necessary factor: the availability of large amounts of relatively cheap wrought iron (brought about by the rise of the railroads).

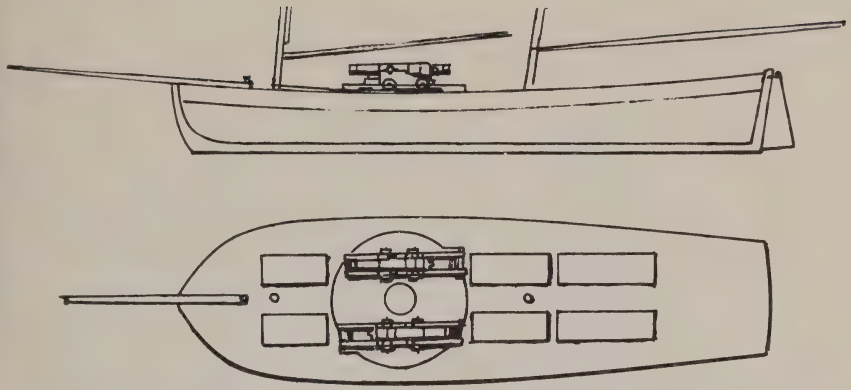
The decisive factor in their birth was the development of the heavy naval gun, and especially of the heavy shell gun.

The War of 1812 had demonstrated, to the United States Navy at least, that a few heavy, long-range guns were more effective than many smaller lighter guns. While the great frigates such as the *Constitution* generally carried more guns than their opponents, it was remarked that it was usually their heavy chase guns which were decisive. Similar experiences during the same period led French and British naval architects to the same conclusions, and in the 1820's and '30's the trend in warship design began to turn toward smaller, faster vessels mounting only a few heavy powerful guns.

The pivot gun, which could be rotated to fire in any direction, began to come into general use. This arrangement, which had been used for several centuries on Mediterranean galleys, as well as on minor combatant ships in the Swedish Navy in the 18th century and in both the British and the American navies at the beginning of the 19th, was generally adopted for the armament of the new steam-powered sloops and frigates.

The interest in more effective naval guns led simultaneously to the development of the large calibre rifle and the shell gun. Like the pivot gun, the principle of both was fairly well known. Explosive shells had been used in mortars for many years, and the muzzle-loading rifle, as students of the American Revolution well know, was already in use as a small calibre weapon. Improved methods of producing and forming wrought iron now made large calibre rifles feasible.

The shell gun, for which the French General Paixhans must be credited, spelled doom for the wooden ship. Hitherto, the sides of even the heaviest ships had to contend only with solid shot, which simply attempted to punch a hole through the wood. Now the physical proper-



An early application of the pivot gun—an American gunboat of 1804

ties of wood are such that it is well suited to withstand this kind of shock, coming as it does across the grain, and since wood is naturally buoyant it is always possible, in theory at least, to make the sides thick enough to absorb the impact of virtually any size solid shot. The effect of an explosive shell, however, is something else again. The shell strikes the wooden wall, burrows part way into the wood, and then, almost entirely confined, explodes under almost ideal conditions. And, since its force is exerted in all directions, it splinters the wood (and most likely sets it afire). The difference can be compared to that between chopping a log and splitting it.

Once these shell guns became operational, it did not take much imagination to see that iron armor was now a necessity. This was well proved in the Battle of Sinope in 1853, in which the Russian fleet, using Paixhans' shell guns, virtually annihilated the Turkish fleet. After experimenting with iron-plated floating batteries in the Crimean War, both the British and French began to build ironclads, beginning with the French *Gloire* in 1859 and the British *Warrior* in 1860. Both of these ships, and the others of their respective classes which soon followed them, were, nevertheless, conventional propeller-driven steam frigates. Only their sides were armored, their armament and sailing rig remaining quite conventional.

The Americans' response (and we must here include John Ericsson, the Swedish-born inventor of the *Monitor*) was at once a complete break with a 500-year tradition in warship construction, and at the same

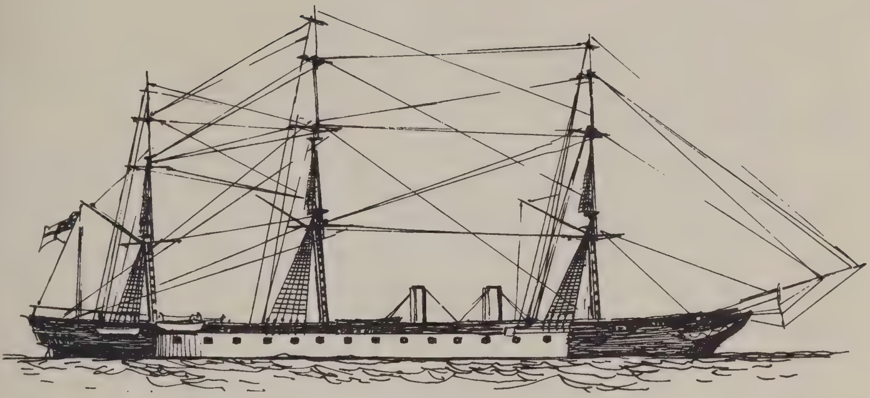
The *Gloire*

time very much in keeping with their own tradition, and particularly their own naval tradition. Since this tradition is very much alive today, and is quite possibly the chief reason for the continued existence of the United States, it is worth while at this point to examine it.

Beginning with the construction of the magnificent frigates of the *Constitution* class in 1795, and continuing with the ill-conceived gunboat program of 1803, the Americans always have tended to consider their warships as tools of strategy and national policy and nothing more. The frigates were a success; the gunboats were a failure. Both were discarded without hesitation when their strategic usefulness was, rightly or wrongly, considered to be at an end. This tendency has continued and has become a tradition, often to the chagrin of buffs who, in every age, have bemoaned the passing of the reigning queens.

Thus, we find that, once the quarrel with the British was ended, the Americans let their sinewy force of frigates gradually molder away (although during this time they built the *Mississippi,* a fine paddle-wheel steamer with 10 pivot guns, and shell guns at that, as well as the first steam-driven ship of war in the world, the USS *Demologos*).

We shall see how, in both the North and the South, the response to the strategic imperatives of the Civil War was also very much in this



The *Warrior*

tradition. Immediately following the war, when the question of the Alabama Claims once more presented the prospect of war with England, the response was again very much to the point: a class of *wooden* cruisers, which were lightly armed and very fast commerce raiders. This threat passed swiftly, and then the cruisers rotted along with the monitors.

The Spanish-American War (which conceivably could have been a German-American or even a Japanese-American War) found the U.S. Navy equipped with an at least adequate force of seagoing battleships and cruisers, which in turn gave way to the largest and finest destroyer force in the world (and the convoy system and the North Sea mining operation) by the end of the First World War. The Second World War required aircraft carriers and landing craft, and in the same tradition they were built and used. Of the nuclear submarines and how they came to be built and on station exactly when they were needed, little need be said.

While the tradition does go back to the time of Nelson, Villeneuve, and Preble, nevertheless its first really great flowering was during the Civil War. Prior to that time, shipbuilding and ship design in a basically agricultural community were rather narrow and specialized fields, and the country as a whole was involved neither in building the Navy nor in manning it. The Civil War, however, drew upon the energies of the entire community (as has every war since). Some of the most fascinating stories of the conflict involve the efforts, successful or otherwise, simply to build these awesome monsters, sometimes in places where the most sophisticated industrial plant consisted of a blacksmith shop and a steam-powered sawmill.

Indeed, it is difficult to escape the conclusion that, although the naval operations were quite possibly the decisive factor in the Civil War, the ironclads as a whole were not—at least not in a narrow tactical sense. The real infighting was done largely by jimcrack shallow-draft gunboats, lightly armored if armored at all; and the blockade and commerce raiding of the North and the South, respectively, was done by conventional wooden steamships. Nevertheless, the fact remains that the ironclads were developed and built in both parts of the country, were weapons (for their time) as exotic as intercontinental rockets, and, for better or worse, the century of destruction began with them.

Part I

Ironclads in the United States Navy

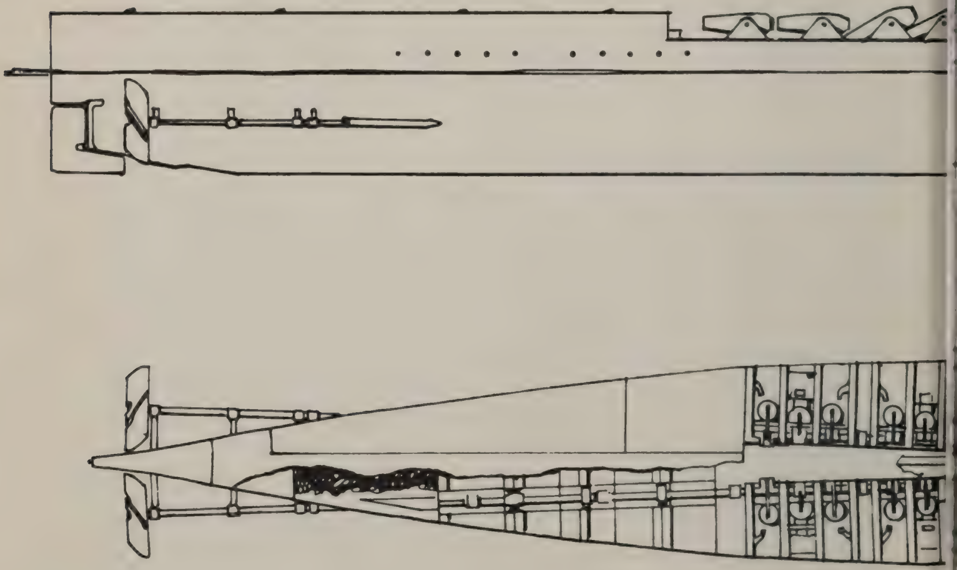
THE STEVENS BATTERY

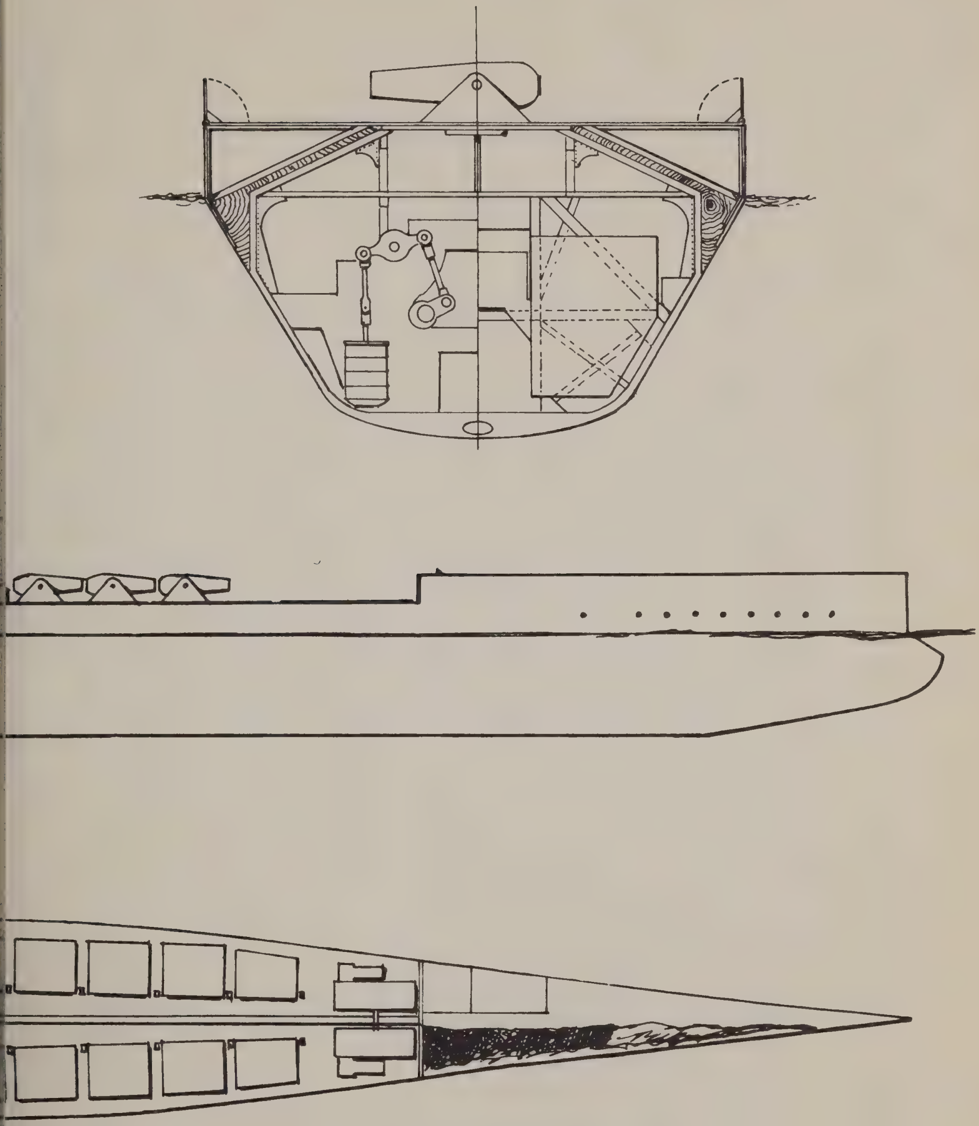
At the outbreak of the war in 1861, there was not a single ironclad of any description in the United States Navy. There was, to be sure, the fantastic Stevens Battery, a truly enormous vessel 420 feet long and displacing more than 6,000 tons, which had been authorized in 1842 and, after several false starts, had been on the stocks since 1854. The death of its builder, Robert L. Stevens, in 1856, had brought construction to a halt, and the ship had remained in a half-finished condition at Hoboken, New Jersey, ever since.

Robert Stevens' two surviving brothers, John and Edwin, offered to complete the ship at their own expense if the government would buy it when it was successfully completed. A board of naval officers was then appointed to survey the ship and decide whether it was worth finishing. The verdict was that it was not, and the offer of the Stevens brothers was declined. Upon the death of Edwin Stevens in 1868, the Stevens

Battery was bequeathed to the state of New Jersey, along with the sum of one million dollars with which to complete it. General George B. McClellan was appointed to head the project, new plans for converting the battery to a turret ram were drawn up, and work actually went ahead, including the installation of new engines. Finally, the million dollars was spent, and the ship was still incomplete, although it appears that work was progressing quite favorably, and the Navy was interested again. Congress, however, was not, and neither was the state of New Jersey. The Stevens Battery was finally scrapped in 1874.

There was no lack of interest in ironclad warships in the Navy, however. In a report to a special session of Congress on July 4, 1861, the Secretary of the Navy, Gideon Welles, asked for authority to build ironclads, providing that competent investigation proved them to be feasible.





The Stevens Battery

The Monitors

On August 3, 1861, Congress passed a bill entitled "An Act to Provide for the Construction of One or More Armored Ships and Floating Batteries and for Other Purposes." The Act authorized and directed the Secretary of the Navy to appoint a board of three naval officers to investigate plans and specifications for ironclad warships, and appropriated $1,500,000 for their construction.

This was the first positive response to the ominous development already taking place at the Norfolk Navy Yard, captured by the Confederates without a fight on April 20. The Confederate Navy Department had authorized an ironclad early in June, and work had already begun on the conversion of the USS *Merrimack* (rechristened the CSS *Virginia*).

The Navy Department issued a request for proposals on August 7, stating that the proposed vessel must be "either of iron or wood or of wood and iron combined, for sea or river service, to be not less than 10 nor over 16 feet draught," armament was to be "of from 80 to 120 tons weight, with provisions and stores for from 165 to 300 persons, according to armament, for sixty days, with coal for eight days, the smaller draught of water, compatible with other requisites, to be preferred."

The advertisement went on to request drawings of the vessel, armor, machinery, etc., as well the cost and time for completion. Twenty-five days were allowed for the completion of plans.

As authorized and directed by the Act of Congress, a reviewing board was appointed. This board, consisting of Commodore John Smith, Commodore Hiram Paulding, and Commander Charles H. Davis, proceeded to evaluate the various proposals, and on September 16 reported its conclusions.

After conceding its authors' scant experience with the subject, the report began with some general conclusions about ironclad warships which, rightly or wrongly, were to influence United States naval policy throughout the war and even into the postwar period.

These general conclusions were as follows:

1. Ironclads are formidable adjuncts to fortifications on land, for coast and harbor defense. As cruisers, their value is questionable, primarily due to the fact that the weight of their armor cuts down on their speed and cruising range.

2. Ironclads will never be able to cope successfully with properly constructed forts, since the fort, in addition to its masonry walls, also can be armored with as much iron as necessary.

3. Armored warships will be most valuable on rivers and in harbors, and for blockading. Thus the immediate requirement is for shallow-draft vessels, invulnerable to shot.

The board also declared itself to be in favor of iron and wood construction rather than all-iron construction. The report then went on to list 16 proposals which had been received and evaluated, including one for a *rubber*-clad vessel. Three designs were accepted. The first was from C. S. Bushnell and Co. of New Haven, Connecticut, for the *Galena*. The second was from Merrick and Sons of Philadelphia for the *New Ironsides*. Both of these ships were more or less conventional ironclads, similar to the ironclads already in existence in the French and the British navies. They represented the conservative approach to the problem, and received the unqualified approval of the board.

The third design selected was that of the *Monitor*, submitted by John Ericsson.

THE *MONITOR*

In its evaluation of Ericsson's design, the board was cautious. After conceding that the raft and turret arrangement would render her shot-proof, it expressed apprehension as to her seakeeping qualities. (These apprehensions were fully justified, as it turned out.) Actually, it was only after Ericsson's good friend, Bushnell, the builder of the *Galena,* had prevailed upon *his* good friend, Secretary of the Navy Gideon Welles, to grant Ericsson an opportunity to explain and demonstrate his plan to Welles, Lincoln, and various naval officers, that the board accepted the plan for the design of the *Monitor.* At that, the acceptance was conditional. The board's recommendation was that one such floating battery be built as an experiment, with a forfeiture in case it did not measure up to its designer's claims.

Since Ericsson had no capital of his own to finance the venture, C. S. Bushnell sought the aid of two of the leading figures in the New York iron industry who were looking for an opportunity to get in on the ground floor of the mushrooming arms business. On September 27, a contract was drawn up between Ericsson and C. S. Bushnell, John A. Griswold, and John Flack Winslow. Griswold was a partner in the Rennselaer Iron Works in Troy, New York; Winslow was a partner in the Albany Iron Works as well as the Rennselaer Iron Works. These three agreed to provide all the financial support necessary to build the *Monitor* and that the four parties to the contract would share equally all net profits or losses. It also was agreed that future construction of any ironclads would be handled the same way. With this kind of backing, Ericsson was able to negotiate a contract with the Navy Department to design and build the ship. The contract was signed October 4, 1862. The Navy agreed to pay the sum of $275,000 in installments of $50,000. At the same time, in view of the experimental nature of the vessel, the government would withhold 25 per cent of each payment pending satisfactory completion and performance of the vessel. Besides specifying the dimensions, speed, etc., the contract called for Ericsson to provide masts, spars, sails, and rigging capable of driving the ship at a speed of 6 knots. Ericsson completely ignored this provision, and no attempt ever was made to hold him to it. The contract further called for a delivery of the completed *Monitor* within 100 days. Work began immediately.

Ericsson's backers formed a very competent team. Together they organized a far-reaching net of subcontractors: Rennselaer was to provide bar iron and rivets, Albany would produce angle iron for the framing, and armor plate; more plate was subcontracted to Holdane and Co. in New York and to H. Abbot and Co. in Baltimore. The ponderous port-stoppers were forged in Buffalo by the Charles D. Delaney Company.

The Continental Iron Works at Green Point, in Brooklyn, was subcontractor for the hull. On October 15, 11 days after the signing of the contract, the first shipment of angle iron from the Albany Iron Works arrived in New York by steamer. Thereafter, daily deliveries were made to the Continental Iron Works or to the turret subcontractor, the Novelty Ironworks, also in New York. Meantime, Delameter and Company was building the engines.

All the designing was done by John Ericsson. From his drafting table at the Continental Iron Works came a continuous procession of drawings, usually rough sketches which were often taken directly to the shops without even being copied by the draftsmen. Every detail was Ericsson's, although the backers, at least, were inclined to credit the idea of the revolving turret to one Theodore Timby, who had secured a patent for such a turret in 1843. (Timby was paid a royalty of $5,000 for every monitor turret built.) Ericsson, in later years, sneered at the idea that the turret was Timby's, and maintained that the royalty paid was simply in the interests of prudence.

The launching took place on January 30, 1862. Due to her questionable buoyancy, two large wooden tanks were attached to her stern. Steam was applied to the boilers of the main engines for the first time the next day. On the 19th of April, the *Monitor* was delivered to Brooklyn Navy Yard for armament and stores. Here she was armed with two 11-inch Dahlgren guns commandeered from the gunboat *Dacotah*. The task of placing these large guns in a rather small turret was accomplished in the following manner: the top of the turret was left completely open and the guns were lowered into place; afterward, the top was roofed with bars of railroad iron spaced several inches apart to form a grating.

Two more trials were made before the vessel set out on its famous voyage to Hampton Roads. On the first trip there was trouble with the main engines. The cutoff valves, according to reports, were improperly set and would not permit steam to enter the engine. (The engines were an Ericsson design too, incidentally.) The design had been tested in the steamers *Judith* and *Daylight*, and Ericsson was rightly confident that there was nothing seriously wrong.

On the second trial, more trouble developed—this time with the rudder. It turned out that the rudder was out of balance, the weight too great forward of the rudder post. The naval authorities immediately wanted to put the *Monitor* into dry dock and build a new rudder, but Ericsson managed to make adjustments to the rudder in place. By this time the newspapers were calling her "Ericsson's Folly."

On the 25th of February, the *Monitor* was commissioned, Lieutenant John Worden having been appointed to her command two weeks previously. He had already received orders to proceed to Hampton Roads, where the *Monitor's* opponent was also in the final stages of construction. Last-minute work was continued almost to 11 A.M., March 6, 1862, when, in tow of the tug *Seth Low*, the *Monitor* departed for her appointment in the South.

Ericsson's design was one of the first examples of what is known in modern terms as a "weapons system." Ericsson himself described it as a "fighting machine." The weapons system concept demands that all components be tailored to achieve the optimum performance in terms of the system's stated mission or function. Thus, the current warships could be described as "armed, armored *ships*," differing from a general ship design only in detail, whereas the *Monitor* actually was conceived as a "self-propelled gun platform." Ericsson's previous experience had been with propulsion systems (he designed the power plant for the USS *Princeton*, the first propeller-driven ship in the U.S. Navy in 1841) and in ordnance, but, after establishing the design criteria, or parameters, for the *Monitor*, he did not hesitate to engineer the entire ship, from stem to stern.*

In an article in the *Century Magazine* in 1885, Ericsson admirably outlined these design criteria:

"1. The work on the *Virginia* (*Merrimack*) had progressed so far that no structure of large dimensions could possibly be completed in time to meet her.

"2. The well-matured plan of erecting a Citadel of considerable dimensions on the ample deck of the razéed *Merrimack* admitted of a battery of heavy ordnance so formidable that no vessel of the ordinary type, of small dimensions, could withstand its fire.

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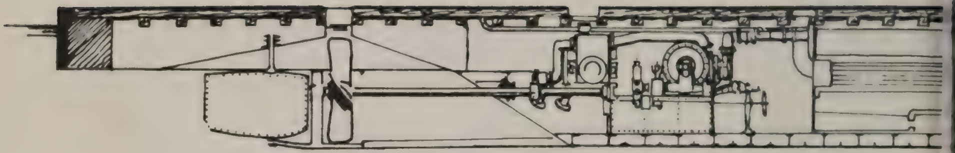
* He had, in fact, submitted a design for a turret ship to the French navy in 1854. It was a model of this ship, demonstrated by Ericsson, which convinced President Lincoln of the soundness of his ideas.



"3. The battery designed by the naval authorities of the Confederate States, in addition to the advantage of ample room and numerous guns, presented a formidable front to an opponents' fire by being inclined to such a degree that shot would be readily deflected . . .

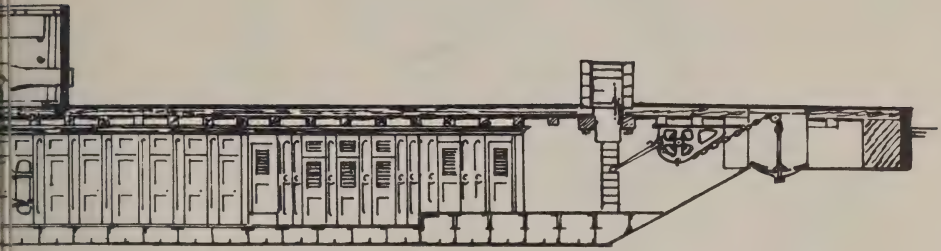
"4. The shallow waters on the coast of the Southern States called for very light draft; hence the upper circumference of the propeller of the battery would be exposed to the enemy's fire unless thoroughly protected . . .

"5. The limited width of the navigable parts of the Southern rivers and inlets presented an obstacle rendering maneuvering impossible; hence it would not be practicable at all times to turn the battery [the vessel—Ed.] so as to present a broadside to the points to be attacked.

"6. The accurate knowledge possessed by the adversary of the distance between the forts on the river banks within range of his guns, would enable him to point the latter with such accuracy that unless every part of the sides of the battery could be made absolutely shot-proof, destruction would be certain . . .

"7. The difficulty of manipulating the anchor within range of powerful . . . batteries . . . called for better protection to the crew than ever previously known."

Ericsson's design was a set of responses to these criteria. Indeed, the ship may be described essentially in terms of these responses:

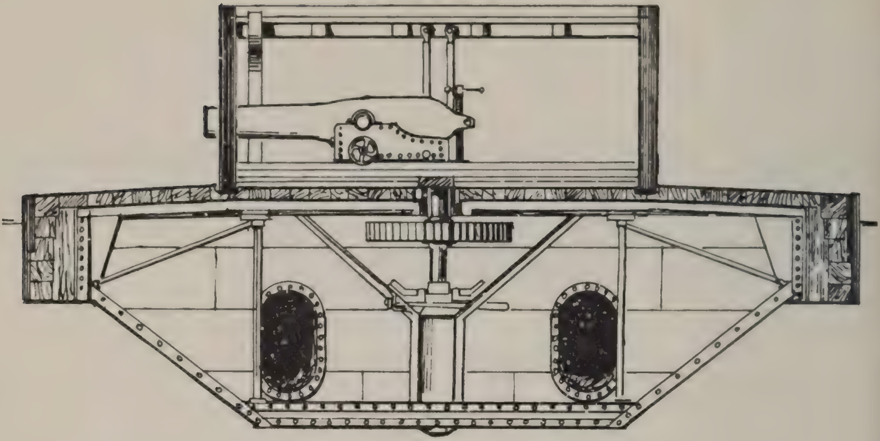


The *Monitor*—Inboard Profile

1. *The ship must be small and constructed quickly.* The *Monitor* measured 172 feet in length and 41 feet in breadth. This was the measure of the armored deck or raft. The hull proper, beneath the raft, measured only 122 feet in length and 34 feet in breadth and drew no more than 10 feet. In the interest of the rapid construction, the bow and stern curves were identical and quite simple, being only arcs having radii of 75 feet. The sides were parallel for about 80 feet. (This same principle was applied in World War II to the hulls of Liberty and Victory ships, as well as submarines.) The hull cross section shows a rather odd and not too seaworthy appearance, due to the fact that, in order to save time in construction, the frames and plates were not curved. Similarly, the raft and turret design was such that Ericsson was able to divide the work among three major subcontractors. If he had designed a conventional "broadside" vessel, the power plant would have had to be completely installed before installation of the armament really could be started.

2. *The vessel must be invulnerable.* One might say that, instead of building a fort, Ericsson dug a trench. He lowered the hull into the water where it didn't present much of a target. The deck, since it only had to cope with shot at an extremely shallow angle, had only 1 inch of iron for armor.

3. *She must be well armed.* The saving in weight embodied in (1) and (2) enabled the *Monitor* to carry two 11-inch guns in the turret,



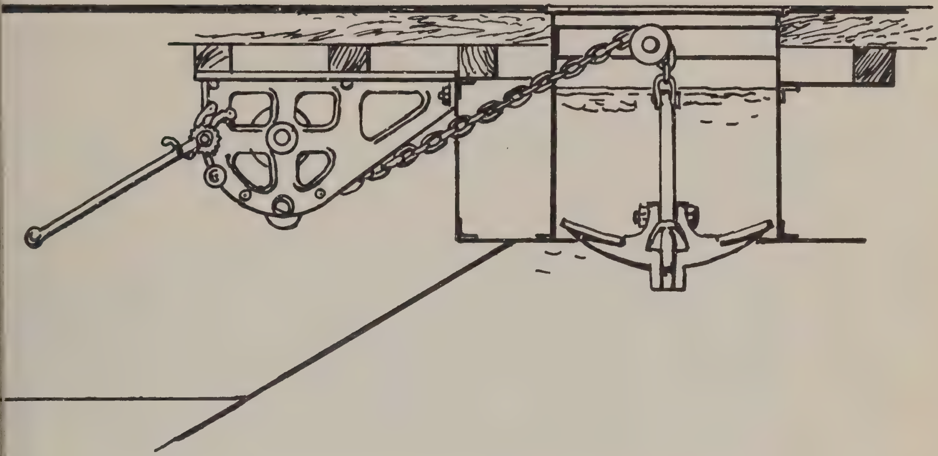
The *Monitor,* Cross Section

larger than anything the *Virginia* could carry. Since no more than half of a casemate battery can be engaged at any one time, this was equivalent to four 11-inch guns, truly a formidable armament.

4. *She must move adequately.* Although having only a 10-foot draft, the *Monitor* carried a 9-foot propeller. Ericsson accomplished this by projecting the raft 32 feet beyond the hull in the stern and hollowing out its 5-foot thickness above the propeller. This was not a perfect solution by any means. The propeller, being partially blocked by the hull, must have produced a good deal of turbulence and lost quite a lot of power.

5. *The battery must be able to fire in any direction.* The turret accomplished this perfectly, in principle at least, and was not improved upon until the advent of the guided missile.

6. *The battery must be shot-proof.* With the saving of weight obtained by lowering the hull, it was possible to armor the turret with 8 inches of iron, double the thickness of the *Virginia*'s armor. Ericsson's original design, submitted to the French, shows a hemispherical turret. The difficulties of construction would rule it out in this case, but one wonders why a conical turret was not considered. In any event, the 8-inch cylindrical turret was ample against the ordnance of that day.

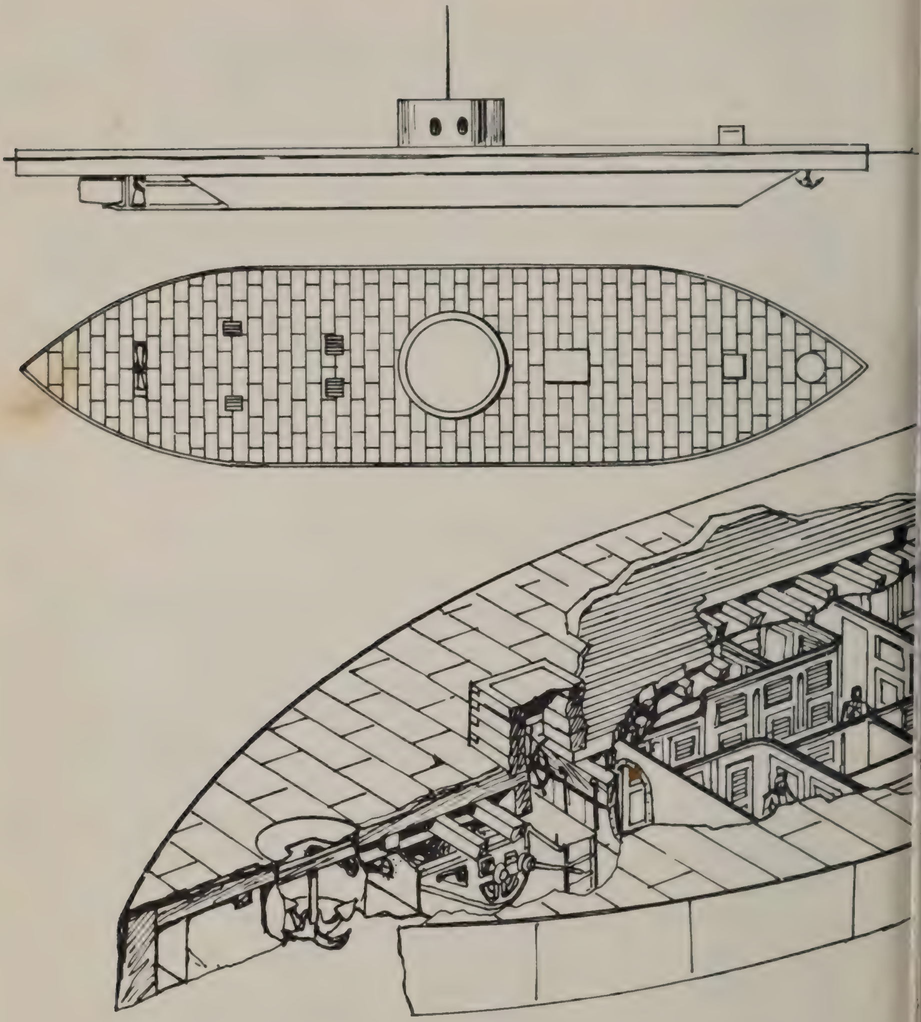


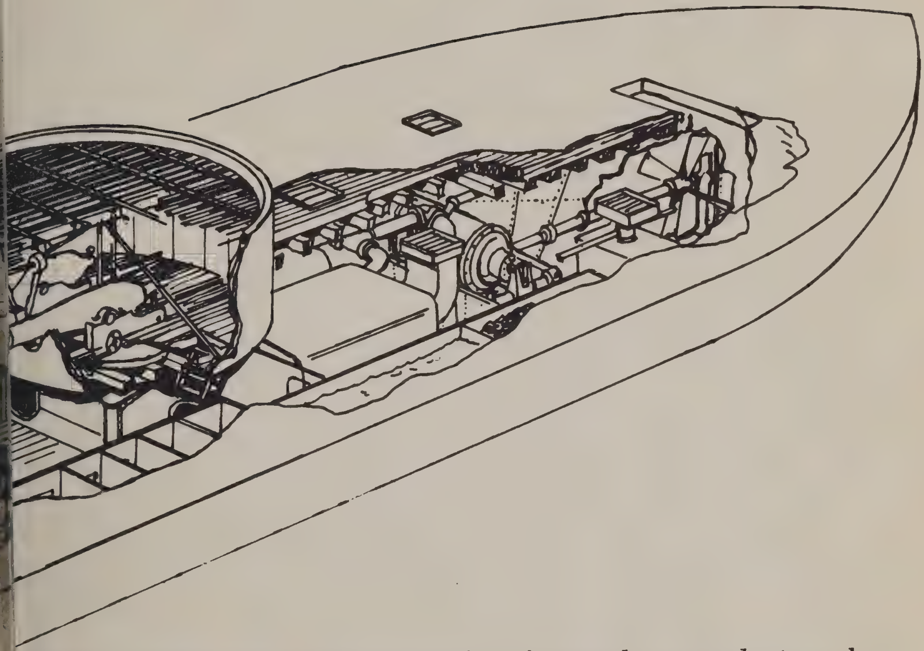
The *Monitor*'s Anchoring System

7. *Anchoring the ship under fire must be practicable.* The conventional system was very much the same as is used today. The anchors were hung from the cheeks of the ship, and controlled by a capstan on deck. The capstan usually was located forward, and was turned by a gang of men. Ericsson located his anchor in a completely covered well in the bow of the raft, utilizing the 14-foot projection beyond the hull to raise and lower the anchor by means of a lever-operated reel. At no time was the anchor vulnerable or even visible. However, he carried only one anchor, and one wonders if he could not have installed a similar anchor aft.

These responses, then, constituted the design of the *Monitor*. Shortcomings there certainly were, and these can be described primarily in terms of criteria which Ericsson ignored.

1. *The ship must be habitable* (since the machinery must have human operators to function). This was the most obvious criticism leveled by the Navy at the design. The lowering of the hull almost to the water line made the ventilation of the ship a serious problem. On the initial voyage from New York to Hampton Roads, the blowers were frequently put out of action by quantities of water coming through the blower pipes as waves broke over the deck. Not only was the crew af-





fected, but also the engines themselves frequently stopped, since they could operate only under forced draft. The water also came in through the smokestack, under the turret, and under the berth deck hatch which could not be secured sufficiently to resist the impact of the waves.

2. *The design must be realizable in terms of the present* [1861] *state of the art.* This fact, of course, is implicit in all designs, unless there is sufficient time and money available to improve the state of the art to accommodate the design. The monitors suffered from a number of troubles due to the limited technology available. One persistent difficulty was that the raft, with its overhang on all sides of the hull, was subjected to tremendous hammering from the sea as the ship rolled and pitched, especially in the bow. The technology of the time could not fasten the

raft securely. In later monitors, most of the overhang was eliminated. The turret, in order to function properly, required a degree of power and control which was almost beyond the technology of the day. The turret was operated on a mechanical gear system powered by a small steam engine. It was slow to start moving, and once started difficult to stop on target. In the battle with the *Virginia,* the turret finally was secured for this reason, and the whole ship was pointed at the target instead. This worked at Hampton Roads, since there was ample room to maneuver, and the *Monitor* could steer rings around the sluggish *Virginia,* but it tended to nullify Ericsson's original criterion—that the battery must be able to fire in all directions. Another bad feature was the decision to locate the pilothouse in the bow, connected with the turret only by a speaking tube which worked only when the turret was trained on centerline. It would have required a telephone for this arrangement to function. Ericsson admitted that this was a flaw, although he tended to blame the other shortcomings on poor handling and training, and attributed it to the speed in construction which did not permit him to locate the pilothouse in what was obviously the best place—on top of the turret. This was done on all subsequent classes of monitors, but it required a more sophisticated construction, for the pilothouse, with its rudder control ropes, had to be located on a stationary column, while the turret rotated beneath it and around the column.

3. *Some defense must be provided against mines.* The "limited width of the navigable parts of the Southern rivers and inlets," to quote Ericsson, was ideally suited to mine warfare, as the Union Navy was to discover. Mines (called "torpedoes" at that time) were quite well known, and one could reasonably expect that they would be used. It is notable that Ericsson, in spite of his weapons system concept, could not come up with an idea to frustrate the mines, other than a rather clumsy raft, which will be described later.

Within a few months after the *Monitor's* test in combat, Congress had authorized the construction of 35 more turret ironclads. These ships received the generic name of *monitor,* which came to mean a relatively small, shallow-draft ship with a small number of large calibre guns mounted in turrets. The type existed, in one form or another, until the First World War, and later. (Great Britain built some in World War II.)

Ten different types or classes were begun during the Civil War, although most of them were not completed or in service by 1865.

THE *PASSAIC* CLASS: *PASSAIC, MONTAUK, CATSKILL, PATAPSCO, LEHIGH, SANGAMON, WEEHAWKEN, COMANCHE, NANTUCKET, NAHANT*

The *Passaic* class was, chronologically, the first class built after the original *Monitor*. The first of the class, the *Passaic*, was commissioned on November 25, 1862, and by spring of 1863 most of her sisters had been launched, commissioned and dispatched to the South Atlantic Blockading Squadron. With one exception—the *Comanche*—all the *Passaic* class saw action in the blockade and siege of Charleston. Though other, more powerful monitors eventually joined them, these ships were the real work horses of the Squadron.

The *Passaics* were simply larger, slightly improved versions of the original *Monitor*. Ericsson designed them, and added such refinements as he would have incorporated into the original monitor had he been given more time.

Apart from the larger dimensions, the first significant improvement was the pilothouse; it was moved from its awkward location near the bow to a position on top of the turret. Since it was not intended to rotate with the turret, it was attached to a fixed vertical shaft 12 inches in diameter which was fastened to the two fore and aft keelsons on the berth deck below the turret. The turret revolved around this shaft. The steering wheel in the pilothouse was linked to the rudder by rods set in grooves in the shaft. The pilothouse itself was cylindrical, of 8 thicknesses of 1-inch plate.

The turret was a foot larger in diameter than that of the *Monitor*, and made of 11 layers of 1-inch plate. The armament was intended to be two 15-inch Dahlgren guns. When the foundries were able to deliver a sufficient quantity, a compromise of one 15- and one 11-inch Dahlgren was made. Naturally, this created problems.* The 11-inch gun had to be fitted into a 15-inch gun carriage; this necessitated a special "yoke" to adapt the trunnions of the 11-inch guns to the carriages.

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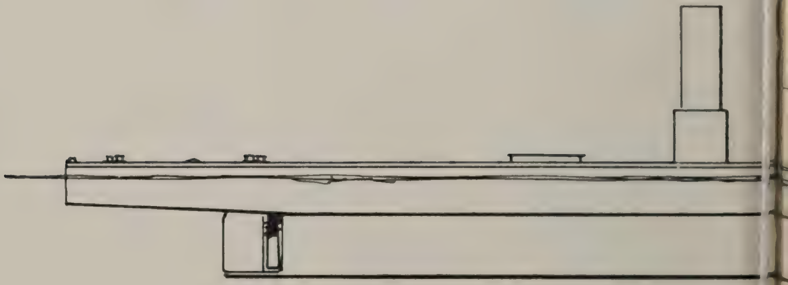
* In a letter to the Navy Department in May, 1863, after the *Passaics* had had time to be reasonably well tested under combat conditions, the captains of five monitors pointed out some of the disadvantages of this system:

"The average time to load, point and fire the fifteen-inch gun does not vary much from seven minutes. It must be remembered that this controls the fire of the lighter piece [the eleven-inch gun—Ed.] or if that be fired oftener, it retards further the slow firing of the heavier gun. We regard a small calibre with a larger proportional charge of powder as desirable, at least when used against brick or stone."

The awkward pendulum-style port stopper of the *Monitor* was replaced by an ingenious crank-shaped forging. A quarter turn would swing the offset portion away from the port to allow the gun to be run out.

When the 15-inch guns were installed, they were all found to be too short to clear the gunport when they were run out. In order to prevent the muzzle blast in the turret, an iron box had to be built around each muzzle, and bolted to the wall of the turret. Later, this box was replaced by a cylindrical casting clamped around the muzzle.

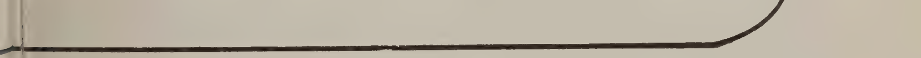
An effort was made to improve the ventilation and air circulation below decks. Two blower engines were provided, and the smokestack was made a permanent installation, armored with eight 1-inch plates to a height of 6 feet, so that it could not be easily shot away. Three hatches were installed in the main deck, and 10 ventilation pipes 4 feet high—six over the living spaces forward, and four over the engineering spaces aft. However, these all had to be closed securely in even a moderately heavy sea or when the ship was in action. Judging from



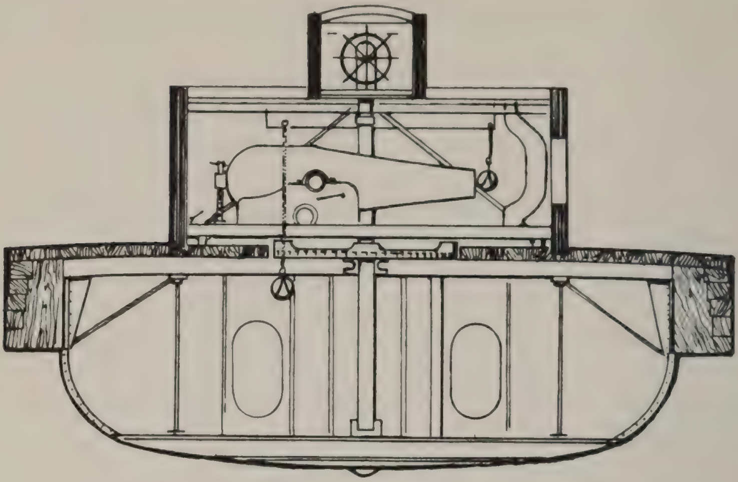
various reports of their captains, the *Passaics* were hardly more livable than the original *Monitor.*

Worse than this, it was all but impossible for the crew to escape from below when the deck hatches were secured. The sole exit left was through a small hatch in the turret. This could be used only when the turret was trained on the centerline of the vessel, and the opening in the floor of the turret aligned with the opening in the deck.

The slab-sided hull of the *Monitor* was replaced by a more or less conventional rounded hull, which improved the stability of the ship. Nevertheless, the fundamental weaknesses of the hull design remained. There was still the strain on the rivets holding the armored raft to the hull beneath. There was still not enough draft to prevent the ship from sheering from side to side when steaming under reduced power. Perhaps the most serious flaw in the design of the hull was its almost total lack of reserve buoyancy. No more than a foot of water in the hold was sufficient to cause the vessel to sink. A contributing factor to this condition was the too shallow waterway (the conduit in the keel which allowed excess water in the forward compartments to flow aft to the pumps). One ship of this class, the *Weehawken,* actually sank at her



The *Passaic* Class



The *Passaic* Class, Cross Section

anchorage in December, 1863, with a loss of 4 officers and 26 men. A court of inquiry determined that the sinking was caused by water coming into the forward compartment through an inadequately stopped hawsepipe and an open deck hatch. The *Weehawken* sank before the water could flow aft in sufficient quantity to reach the pumps.

Another of the class, the *Patapsco,* struck a mine in Charleston Harbor in January, 1865, and sank in 30 seconds with the loss of 62 officers and men.

As they were commissioned early in 1863, the monitors of the *Passaic* class were ordered to the South Atlantic Blockading Squadron, which was engaged in operations against Charleston, South Carolina.

The port of Charleston was at this time one of the principal objectives of the Union high command. The capture of Port Royal in the fall of 1861 had given the Union Navy the base they required for operations against the city. The coming of the *Passaics* gave them the weapons to subdue it.

Throughout the winter and spring of 1863, the Rear Admiral Commanding the South Atlantic Blockading Squadron, Samuel Francis Du Pont, was under considerable pressure from his superiors in Washington, to attack and subdue the formidable forts guarding the entrance to Charleston Harbor. It was hoped that, once this was accomplished, Charleston would fall in the manner of Port Royal and New Orleans.

As the weeks passed, messages from Secretary of the Navy Gideon Welles to Du Pont became more explicit and peremptory on the subject. When Du Pont cited the strength of the forts, and wished for more ironclads, they were sent to him: first the *Passaic*, the *Montauk*, the *Patapsco*, and the *Weehawken*, as well as the armored frigate, the *New Ironsides*, then the *Nahant* and the *Catskill*, and finally the *Nantucket* and the little casemate ironclad, *Keokuk*. It was impressed upon the admiral that he was being beefed up to conquer Charleston, not merely to blockade it, and that, as soon as the place was taken, the monitors were needed elsewhere.

Nevertheless, Welles was careful to leave the final decision to Du Pont; on January 31, 1863, he wrote:

"The Department does not desire to urge an attack on Charleston with inadequate means and if, after careful examination, you deem the number of ironclads insufficient to render the capture of that port reasonably certain, it must be abandoned."

Welles went on to mention the harbor obstacles (mines, pilings, nets to foul propellers) at Charleston as being the only factor which could prevent the capture.

"If they [the obstacles—Ed.] are not considered sufficient to prevent your entrance, it is not believed possible for the rebels to prevent your success with all other means combined."

By April, 1863, Du Pont was ready to move. The ironclad fleet was assembled in North Edisto Inlet, a safe anchorage only 20 miles from Charleston. From there, on the morning of April 5, the ships set out for Charleston—the monitors on the ends of towlines, the *New Ironsides* and the *Keokuk* under their own power. They arrived at the entrance to the harbor that same afternoon. The *Keokuk* was given the task of sounding and marking the Main Ship Channel, with the *Catskill* and the *Patapsco* escorting her.

The next morning the fleet was anchored in the channel, on the edge of the long shallow bar running parallel with the harbor entrance.

Du Pont planned to attack that day, but the forts were obscured by fog and the pilots refused to go farther.

At noon on the following day, the pilots were ready to move. The main objective was to be Fort Sumter. Orders were for the Morris Island batteries to be ignored. The ships were to move past Sumter on the north side and take up positions to the northwest, somewhat beyond the effective range of Fort Moultrie on Sullivan's Island. The ships would proceed in "line ahead." The order of battle was as follows:

Weehawken	Captain John Rodgers
Passaic	Captain Percival Drayton
Montauk	Captain John L. Worden
Patapsco	Captain Daniel Ammen
New Ironsides (flagship)	Commodore Thomas Turner
Catskill	Commander George W. Rodgers
Nantucket	Commander D. M. Fairfax
Nahant	Commander John Downes
Keokuk	Commander A. C. Rhind

Rear Admiral Du Pont was aboard the *New Ironsides.*

The *Weehawken* had been equipped with a specially designed raft (by John Ericsson) to destroy the obstructions expected to be encountered in the harbor. This was to be done by means of explosive charges attached to chains dangling from the underside of the raft which was to be pushed ahead of the *Weehawken.* Ericsson and Chief Engineer Alban Stimers had great faith in the raft; Captain Rodgers of the *Weehawken* did not. He refused to carry any explosives, fearing to damage other ships. Given the current, the tides, and the indifferent steering qualities of monitors, he had a good point, although what he hoped to accomplish without the explosives is not clear. As the *Weehawken* was getting under way, her anchor fouled in the dangling chains of the raft. The whole program was delayed an hour and a quarter while the anchor was removed from the chains.

When the *Weehawken* was finally under way, the raft caused her to sheer from side to side. Naturally, the other ships following were affected, and as the monitors always tended to sheer and sideslip at low speeds, the whole line was delayed. Moving in this exasperating fashion, it was not until 2:50 P.M. that the line came even close to the forts.

Twenty minutes later, the monitors began to come near enough to Fort Sumter (about 1,000 yards) to open fire on it. They, in turn, were now being subjected to a heavy fire from Sumter, Moultrie, and the batteries on Sullivan and Morris islands.

In a few minutes, the *Weehawken,* still leading the line and pushing the raft, came upon a triple row of floating casks almost touching one another. They indicated mines, or pilings with ropes attached . . . or both. A mine exploded near the monitor. Captain Rodgers immediately decided not to try the obstructions. He turned to seaward, under the continuous fire of the forts.

The tide had now reached full flood and began to ebb, adding its force to that of the current. When the *Weehawken* turned, the *Passaic* and the *Montauk* stopped and continued to fire at Sumter. The current began to affect them, and they turned. The *Patapsco* followed, running aground briefly.

The *New Ironsides*, the next in line, already had found the current too much for her, and hoisting a signal for the ships behind her to disregard her motions, she turned to starboard. The smoke was so thick by this time that her captain could hardly see 50 yards ahead. The *Catskill* went by her and took up station about 600 yards from Sumter, followed by the *Nantucket*, the *Nahant*, and the *Keokuk*. The leading ships had now also taken up positions in this same area, where they were easy marks for the gunners of both Sumter and Moultrie. The *Keokuk* pushed ahead of all the others to about 550 yards from Sumter.

As the monitors continued to absorb shots from the forts, their own fire began to diminish, although none of them had been fatally damaged so far.

The *Nahant*'s turret jammed as a result of three shots hitting the base; the port stopper of the *Catskill*'s 15-inch gun jammed from the effects of several heavy shots; the *Passaic*'s turret was buckled, disabling the gun; on the *Patapsco* the cap square bolts of the 200-pounder rifle broke, and the gun was out of action; the same thing occurred on the *Montauk*.

The *Keokuk* was riddled: in 30 minutes she had been hit some 90 times. Finally, at 4:40 P.M., to quote her commander:

"Finding it impossible to keep her afloat under such extraordinary fire . . . I reluctantly withdrew from action . . ."

At 5:00 P.M., Du Pont decided that the monitors had had enough. The tide was ebbing fast, creating hazardous conditions for maneuvering, so he hoisted the signal to break off the action and retire. Because of the smoke, it was some minutes before all the ships saw the signal.

The *New Ironsides*, with a broadside battery of seven 11-inch shell guns and one 200-pounder rifle, had not been able to get closer than 1,000 yards, because of the current, the shallow bottom, and the tides. She had fired only one ineffective salvo.

By sundown, the ironclads were back in their anchorage off Morris Island, examining their injuries. That night, the monitor captains met with Du Pont aboard the *New Ironsides* and gave him a verbal report of the damage. After hearing them, he decided not to renew the attack the next morning. He reported his decision the following day to Secretary Welles:

". . . the Commanders of the Monitors came on board and reported . . . the injuries to their vessels, when, without hesitation or consultation (for I never hold councils of war), I determined not to renew the attack, for in my judgement it would have converted a failure into a disaster; and I will only add that Charleston cannot be taken by a purely naval attack . . ."

The written reports submitted by the captains on April 8 explain the reason for this decision:

Passaic	Hit 35 times. Brass ring beneath turret broken. Pilothouse smashed.
Weehawken	Hit 53 times. Side armor shattered in one place. Deck pierced.
Montauk	Hit 14 times. Entire aft starboard section of side armor torn loose.
Patapsco	Hit 47 times. No serious damage.
Catskill	Hit about 20 times. No serious damage.
Nantucket	Hit 51 times. Turret so dented that 15-inch gunport stopper unworkable. Several side plates and deck plates loosened.
Nahant	Hit 36 times. Turret dented and jammed. Turret steering gear disabled. Side armor loosened and shattered in several places.

Keokuk	Hit more than 90 times. Nineteen shots hit below the water line. Turrets pierced in many places. Ship sank at 7:30 A.M., April 8.
New Ironsides	One port shutter knocked off.

None of the ironclads had been under fire longer than 30 minutes. In their reports, their commanders were emphatic about the folly of renewing the attacks, even though no vessel, except the *Keokuk*, had been damaged decisively. The Fleet Ordnance Officer, Lieutenant MacKensie, calculated that the squadron had fired a total of 139 shots at the fort.

Rear Admiral Du Pont's decision not to renew the attack was not received with much sympathy in Washington. Welles had been quite prepared to lose a few ironclads in the attempt, and the relatively light damage reported did not set well with him, nor with President Lincoln.

Accordingly, Chief Engineer Alban Stimers, serving in the fleet before Charleston, was ordered to inspect the damaged ironclads and report directly to Welles. In his report, Stimers criticized the monitor commanders for not using more rafts such as the *Weehawken* carried, and for not using the explosive charges provided to blow up torpedoes and obstructions. He ignored the *Weehawken*'s steering difficulties with the raft. He further noted that "there were no clear passages [holes—Ed.] through the decks, and no penetration through the sides of the vessels, or the pilot houses." He did concede that there were faults in design, which could be remedied in the ships now under construction.

The main point of contention between the Navy Department, represented by Stimers, and the monitor captains, represented by Du Pont, was not so much the damage that had been done, but rather what would be done in the next round. The captains, naturally enough, were very much concerned with this, especially in view of the lack of buoyancy and almost escape-proof features of the monitors. Stimers was not. All the captains mentioned the vast numbers of bolts that were knocked out or loosened, and in the back of their minds must have been the fear (although they were certainly brave men), that even chance leaks could sink their ships.

As further events proved, they were right.* Aside from the injuries, the prospect of challenging mine fields did not appeal to them at all, and mines were a distinct danger, especially in Charleston Harbor.

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* When the *Weehawken* foundered.

Following Stimers' report, the *Passaic* was ordered to New York, where an examining board, under the direction of Rear Admiral F. H. Gregory, was convened to survey the damage. The board's report was essentially the same as Stimers'.

The results of this investigation got into the newspapers, of course, and prompted a joint letter to Secretary Welles from the six remaining monitor commanders at Charleston. This letter, which would have been unthinkable during, say, the Second World War (or the First, for that matter), proceeded to refute both reports in detail (although not mentioning them by name, referring only to irresponsible newspaper statements). Du Pont forwarded their statement, and sent one of his own, also replying ostensibly to the newspaper articles, but actually to his critics in the Navy Department and the White House.

This began a rather bitter correspondence between Welles and Du Pont, always on the subject of newspaper articles. Welles chided Du Pont for worrying about the press when he should have been attacking Charleston. He also rebuked him for depreciating the powers of assault and resistance of the ironclads. More bickering followed, including Du Pont's preferral of charges against Chief Engineer Stimers for falsehood and conduct unbecoming an officer in the Navy. Stimers was duly tried and acquitted of the charges, and Du Pont was relieved of command on June 3.

The Civil War was full of incidents such as this on both sides. Aside from the personalities and politics involved, it may be said that much of the furious debate was the result of inadequate command structures. Both sides were well on the way to creating modern war machines. The design and the procurement of the monitors, as we have seen, was extremely modern. At the same time, the command structure of the Navy and the South Atlantic Blockading Squadron hardly differed from that of the days of Nelson.

Du Pont was vindicated, in a sense: Charleston never was taken by sea, although in time the forts were reduced to rubble. Stronger, more powerful monitors were built, however, as a direct result of the relative failure of the *Passaic* class on April 7, 1863.

THE *CANONICUS* CLASS: *CANONICUS, CATAWBA, MAHOPAC, MANYUNK, MANHATTAN, ONEOTA, SAUGUS, TIPPECANOE*, AND *TECUMSEH*

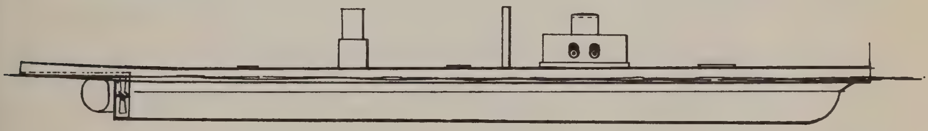
Some of the shortcomings of the *Passaic* class were recognized early enough to be corrected in the design of the 9 ships of the *Canonicus* class. The side armor of the raft, made up of five 1-inch thicknesses of iron, like the *Passaics,* was strengthened by the addition of two "armor stringers," iron belts 6½ inches wide, running around the ship under the armor. For a distance of about 70 feet from the bow, these belts were 6 inches thick, and for the rest of the distance they were 4 inches thick. This made the armor near the water line at least 9 inches thick, at what experience had proved to be a vulnerable area. The deck armor was also increased to 1½ inches thickness.

An additional band of armor 5 inches thick and 15 inches high was added to the base of the turret, while the turret itself was only 10 inches thick as opposed to the 11 inches of the *Passaics*. A more sophisticated recoil system also was introduced for the two 15-inch guns—a gear train from the gun carriage to a friction wheel was used. The guns themselves were 16 inches longer than those of the *Passaics,* eliminating the cumbersome smokebox.

The pilothouse on top of the turret was strengthened with two additional layers of 1-inch plate, giving its walls a thickness of 10 inches.

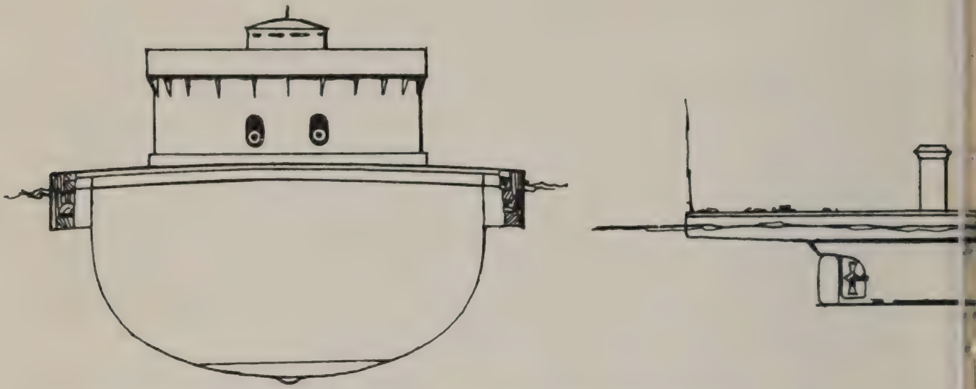
In order to handle the additional load of armor, the main engines were supplied by four boilers instead of two, and the ships were driven by a 14-foot-diameter propeller. In an effort to overcome the perennial ventilation problem, three, more powerful air pumps and blowers were provided.

The first of this class, the *Canonicus,* was launched less than 18 months after the *Monitor,* and just less than a year after the *Passaic.*



The *Canonicus* Class

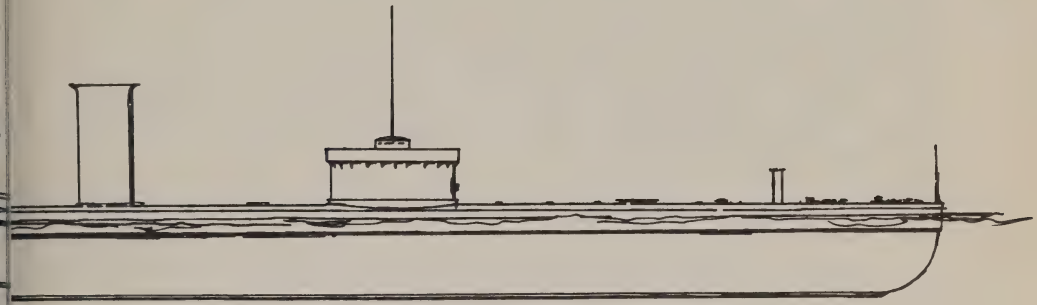
THE *DICTATOR* CLASS: *DICTATOR* AND *PURITAN*



With the success of the original *Monitor,* the Navy Department's concern was primarily with production. Contracts for monitors were spread far and wide, and as service experience indicated design modifications, they were incorporated into the ships under construction.

Although Ericsson was interested in this phase, and worked on it as required (somewhat to the concern of his partners, who saw this as an effort at times competitive to their own), his real interest was in the *Dictator,* and its sister ship, the *Puritan.*

The *Dictator* was a seagoing ship (rather than a shallow-draft "floating battery"), 312 feet long and with a draft of 21 feet. In the face of considerable pressure from the Navy Department, Ericsson insisted on retaining the single turret with an almost 360-degree field of fire, the basic feature of the monitor type. By this time, the single-turret concept was the subject of considerable controversy on both sides of the Atlantic. The argument against the single turret was simply that two guns are better than one (or in this case, four guns are better than two); once having constructed a hull, engines, etc., two turrets could be mounted upon it for only a relatively small total increase in weight. The argument was extended to justify casemated ships carrying even more guns. Ericsson refuted this by pointing out that the weight increase required for an extra turret could be utilized more profitably in building a still larger gun and heavier armor, so that a single-turret ship always would be more powerful than a multiple-turret or casemate ship of the same tonnage.



The *Dictator*

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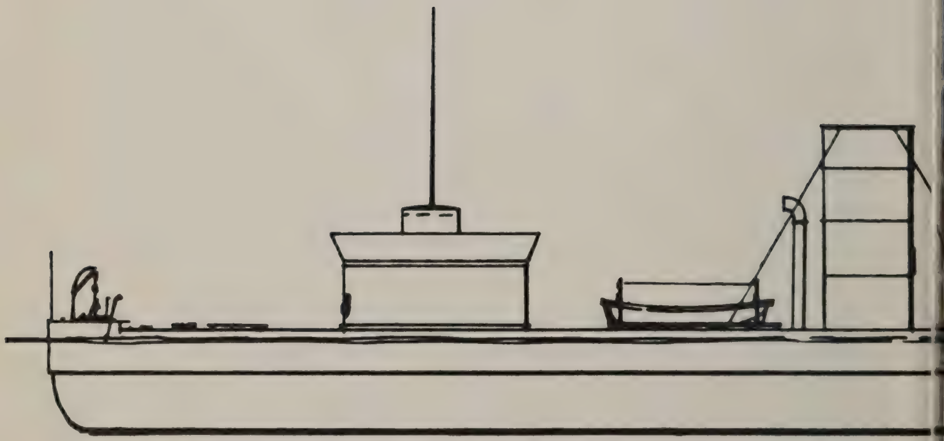
As usual he was right from a strictly engineering point of view, but, as his opponents were quick to reply, this argument ignored some of the operational realities of the situation: the turret could be jammed, an explosion inside the turret could occur, the ammunition hoist could break down, any number of chance malfunctions could put the turret out of action and render the entire ship harmless; whereas with two turrets, this chance factor was halved, and with a casemate, the factor diminished even further.

In subsequent warship development, the multiple-gun principle was adopted universally, although with the advent of the HMS *Dreadnought* there was a return to Ericsson's concept of a few really powerful guns, at least in principle. But of course this occurred only after enormous strides had been made in the efficiency of warship construction.

The *Dictator* was somewhat less than a complete success. She was found to be less buoyant than intended, and consequently her planned speed of 16 knots was cut to 12, and she could carry only half of her planned coal supply. Although her turret operated satisfactorily at sea, and she steered well, she was not considered capable of fighting contemporary battleships at sea, and so reverted to the typical monitor role of a coast defense ship, where her deep draft hampered her effective use.

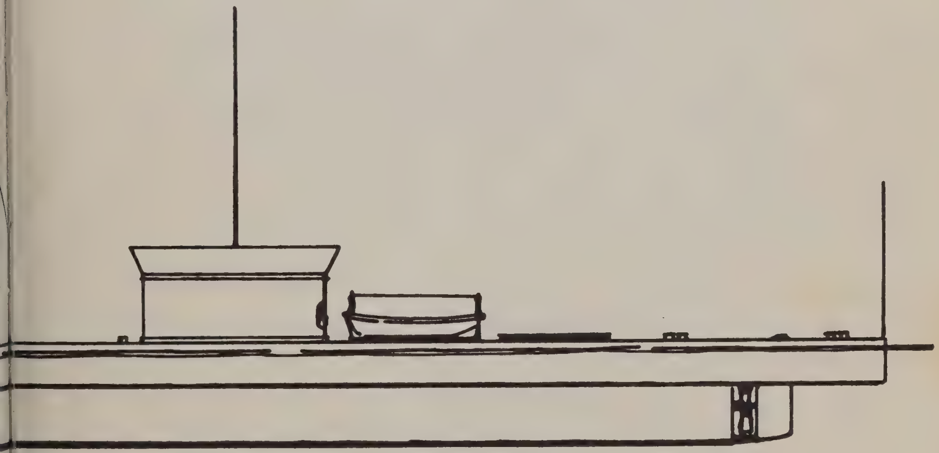
The *Puritan* was even less of a success. The Navy Department insisted that she be built with two turrets, much to Ericsson's disgust. Eventually, his single turret principle prevailed, however, and she was finally built with an enormous turret mounting two 20-inch guns. The end of the war found her still incomplete. Work was resumed on her in 1874, and was stopped again. She was eventually completed in 1898 as a coast defense battleship, but by that time little remained of the original *Puritan* except the name.



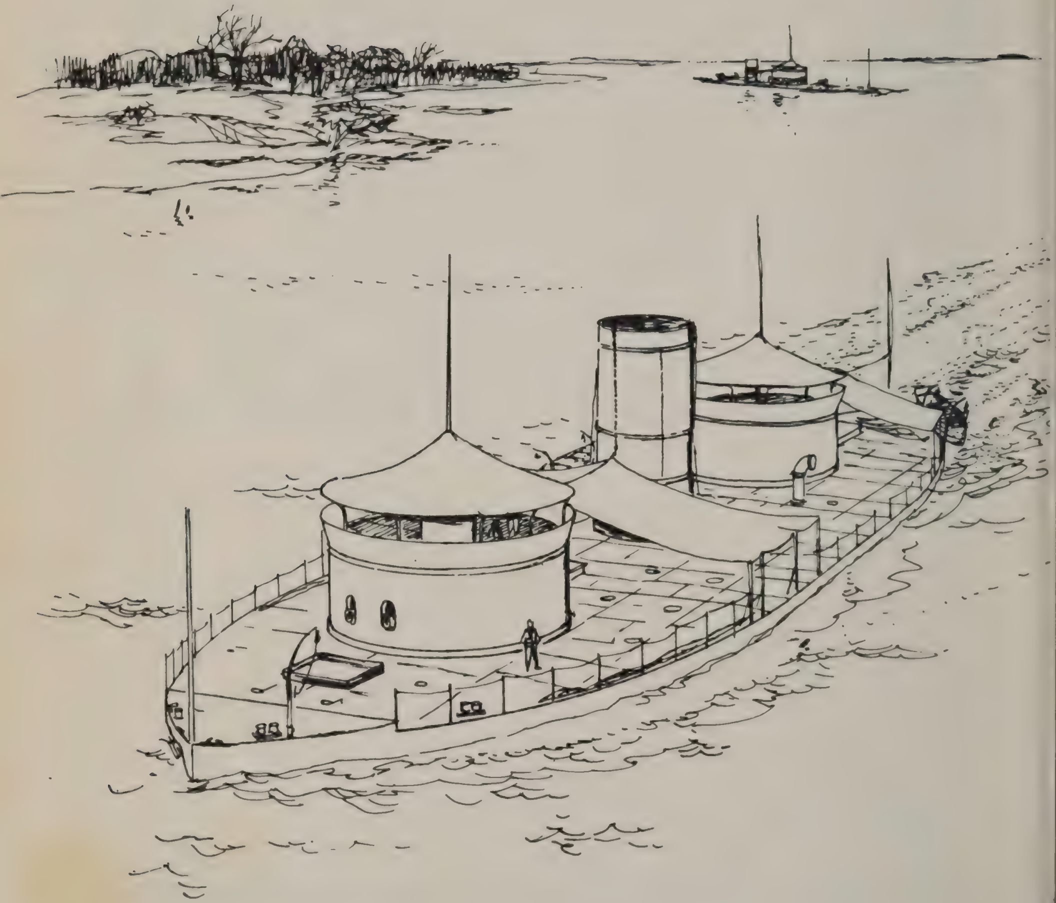
THE *ONONDAGA*

While Ericsson continued to insist on the principle of a single turret, the advantages of multiple turrets were so obvious that the Navy Department went ahead and began to contract with other designers for multiple-turret ships. While the *Roanoke* was a makeshift, the *Onondaga* was built from the keel up by the Continental Iron Works under contract to George Quintard of New York. By all accounts the *Onondaga* was a thoroughly practical ship. Although hardly larger than the monitors of the *Canonicus* class, she had a far more powerful armament—two 150-pounder rifles in addition to two 15-inch Dahlgrens.

Commissioned in March, 1864, the *Onondaga* was stationed in the James River, where, with the exception of one skirmish with the Confederate James River ironclads, she had an uneventful career. After the war, Quintard, by a special Act of Congress was permitted to refund the purchase price and resell her to the French Navy at a handsome profit, an arrangement which must have had some interesting political ramifications.



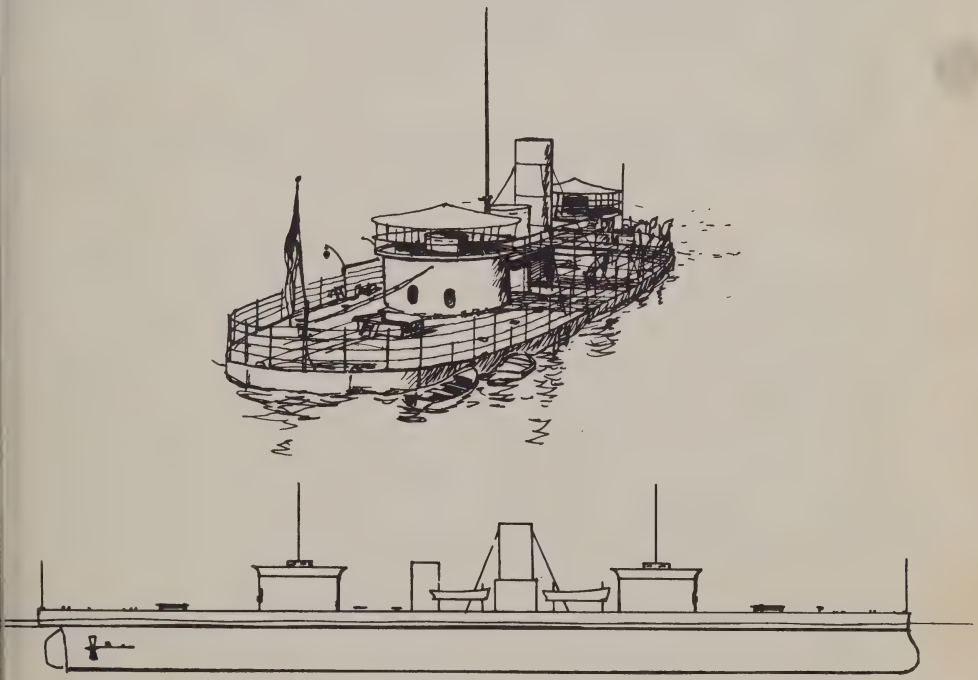
The *Onondaga*



The *Onondaga*

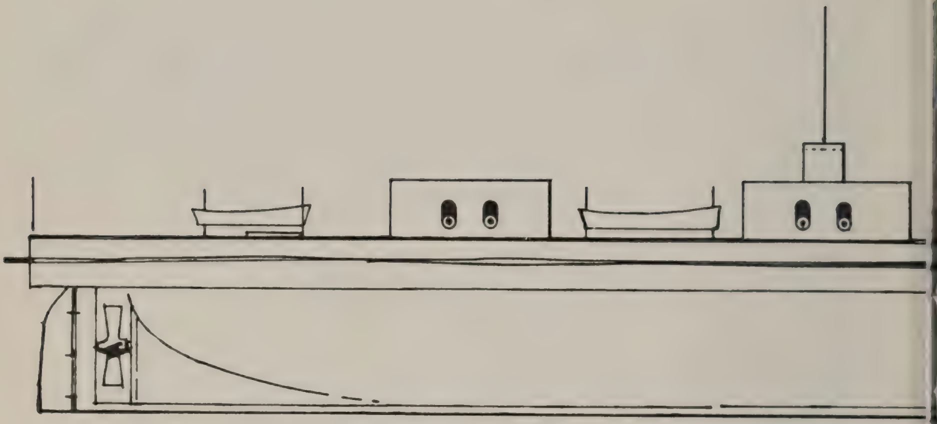
THE *MIANTONOMOH* CLASS: *MIANTONOMOH, MONADNOCK, TONAWANDA* AND *AGAMENTICUS*

Four other double-turret monitors were laid down in 1862. These ships carried four 15-inch Dahlgrens and were somewhat larger than the *Onondaga:* 257 feet long, 52-foot beam, and a 21-foot draft. Only one of these ships, the *Monadnock* was completed in time to see any service in the war. The *Miantonomoh,* completed in the fall of 1865, made a voyage to Europe in 1866, the first monitor ever to do so. This proof of the monitor's seaworthiness made a considerable impression on European navy people and influenced them to build some of their own.



The *Miantonomoh* Class

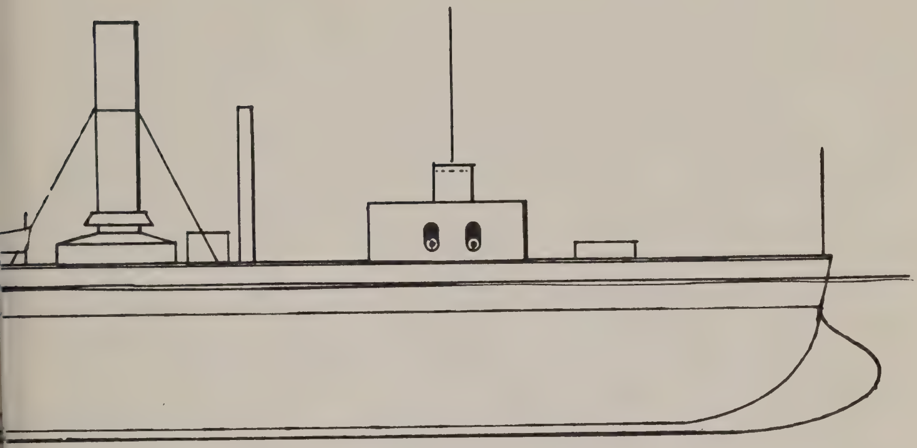
THE *ROANOKE*



In April of 1855 Congress authorized the construction of "six first class steam frigates to be provided with screw propellers." These ships were superior to any warship in the world when they were completed the following year and were admired and copied by European navies. For five years they reigned supreme, and then, with the coming of the ironclad, their type was outmoded forever.

One of these frigates was the *Merrimack*. The story of her burning at Norfolk and her rebirth as the CSS *Virginia* is well known. There was, however, another ironclad conversion in this class—the *Roanoke*—and the result, in addition to being less spectacular, was somewhat less effective.

The *Roanoke,* along with still another of the class, the *Minnesota,* was present at Hampton Roads on the day when the *Virginia* made her devastating appearance. Both ships, after getting under way (the *Roanoke* only with the help of tugs, since her main shaft was broken), grounded and were saved from almost certain destruction only by the fact that the *Virginia* drew too much water to come after them without grounding too.



The *Roanoke*

As a result of its expensive lesson at the hands of the Confederates, the Navy decided to make an ironclad out of the *Roanoke*. On March 25, 1862, she was decommissioned at Brooklyn Navy Yard and her conversion begun. She was cut down almost to the water line in the same manner as the *Virginia* had been. Here the resemblance ended. Instead of a casemate, three Ericsson turrets were installed by the same Novelty Iron Works which had been responsible for the turret of the *Monitor*. The result was a formidable-looking ship. Her performance, however, was somewhat less. Her deep draft hampered her as much as the same deep draft had hampered her famous sister, and the weight of the turrets was a serious strain on her hull, in addition to causing her to roll excessively in heavy seas. Recommissioned in June, 1863, she continued to be used in the North Atlantic Blockading Squadron, but she was not very effective. On June 25, 1865, she was decommissioned for the last time. Inadequate as she was, she still rates the distinction of being the first seagoing turret battleship.

THE *CASCO* CLASS

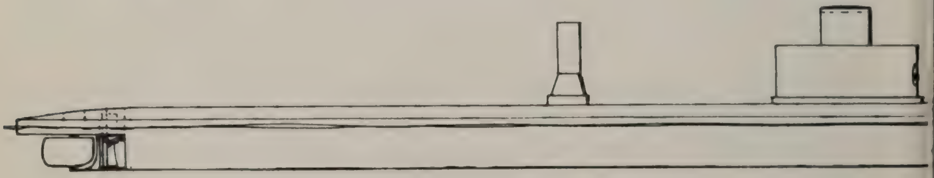
The war in the Mississippi Valley required ironclad warships. At first the makeshift gunboats were adequate, but as Confederate shore defenses became more powerful and better organized, it was obvious that something more potent would be required. This inspired one of the most ambitious building programs of all—the shallow-draft monitors.

In August of 1862, Gustavus Fox, the Assistant Secretary of the Navy, who functioned as a de facto Chief of Staff, asked Ericsson to design a shallow-draft monitor suitable for operations on the Mississippi and its tributaries. Specifically, he wanted a 10-foot draft. These monitors would be contracted for by the government, and Ericsson would receive $10,000 royalty on each one built.

Fox received a preliminary plan in something like two days, and by October this plan was developed into a complete set of specifications for a vessel 221 feet by 41 feet, with a draft of only 6 feet.

The Advertisement for Bids followed on February 24, 1863, and for the first time Ericsson learned that his original specifications had been radically altered, by—among other things—a requirement for a *4-foot* draft!

What had happened was this: Under pressure from the Cabinet, the Army, the Bureau of Yards and Docks, the Assistant Secretary had appointed the ubiquitous Chief Engineer Alban C. Stimers to revise Ericsson's design.



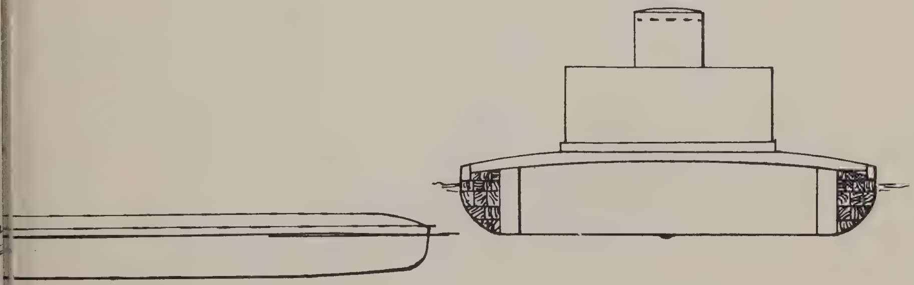
The *Casco* Class

As in the case of the *Dictator,* additional requirements were imposed: a heavier turret, ballast tanks (normally filled with water) that could raise the hull when emptied, a heavily armored pilothouse. Discarded was the forward overhang of the armored raft which had been perennially objected to.

When Ericsson learned of these changes, he wrote to Fox and told him that the design was unsound; he offered to redesign the ship himself, otherwise he wanted no part of it. Ericsson further informed the Assistant Secretary that Stimers had not really consulted him, and had talked briefly on minor points, giving Ericsson no idea what he was doing.

In spite of this, Stimers was allowed to continue. When the Bureau of Construction refused to approve his plans, he was established in New York with an organization of constructers and engineers (which was almost as large as the total office force of the Navy Department), reporting directly to Fox. From here he managed a $14,000,000 operation, with ships building in Boston, New York, St. Louis, Cincinnati, Philadelphia, Pittsburg, Baltimore, and Portland, Maine. While the project was getting under way, he was sent to inspect the *Passaics* engaged at Charleston, and his collateral duties included supervising the construction of the *Canonicus* class. Ericsson, and Rear Admiral Gregory, of the Bureau of Construction and Steam Engineering, were ignored.

In a letter to Gregory in May, 1864, Ericsson confidently predicted that the *Cascos* would sink on launching. He had come to this conclusion after inspecting a set of standard contractor's plans.

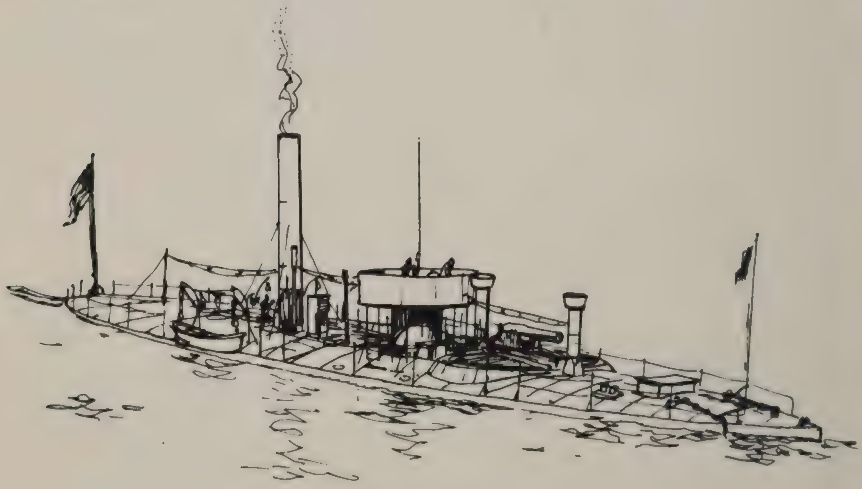


The *Chimo* was the first of the class to be launched. While she did not actually sink, she had only 3 inches of freeboard, instead of a planned 15 inches, and this was *without* guns, stores, fuel, or crew!

The wretched Stimers was removed immediately as General Superintendent of the *Casco* project, and the problem of what to do next was handed to Rear Admiral Gregory. Gregory wasted no time in calling on Ericsson, who was most insistent that it be made clear he had nothing to do with the fiasco.

At this time both Rear Admiral Dahlgren, of the South Atlantic Blockading Squadron, and Rear Admiral S. P. Lee of the North Atlantic Blockading Squadron were asking for torpedo boats, so it was decided to convert to this use the five vessels nearest to completion. The turrets were eliminated and a single unprotected 9-inch pivot gun mounted on deck. The others had their sides built up 15 inches.

Stimers was appointed, with some irony, to the post of Chief Engineer of one of the five converted *Cascos*, the *Tunxis*. Upon reporting for duty, he was confronted with a handsome brass plaque, attached to a bulkhead, which proclaimed that this ship had been "built from designs prepared by Alban C. Stimers, Chief Engineer, U.S.N." (Officers of the *Tunxis* related that Stimers was found later attempting to remove the plaque with a cold chisel.)



The *Tunxis*

The total effect of the monitors upon war was, in the final analysis, not very great; certainly it was far less than the effect of the armored gunboats of the Western Flotilla. Their relative failure at Charleston cast doubt on their ability to attack forts, a requirement, it will be remembered, which was one of their chief reasons for existence. Although monitors were decisive in operations against the Confederate ironclad *Tennessee* at Mobile Bay, they were found to be extremely vulnerable to mines. The *Tecumseh* was lost to a mine at Mobile Bay and later two shallow-draft monitors of the *Milwaukee* class were also lost. In further action against the Confederate forts in the Mobile area, they were not especially effective, nor in subsequent operations against Fort Fisher, guarding Wilmington, North Carolina, were the *Canonicus,* the *Saugus,* and the *Mahopac,* and the double-turreted *Monadnock* in the bombardment.

As demonstrated in action, the greatest design fault of the monitors was their general unseaworthiness and low buoyancy. The ease with which they foundered and the sickening rapidity with which they sank when they struck a mine were defects which the invulnerability of their decks and turrets could not quite counterbalance.

The end of the war brought an immediate halt to the design and construction of monitors. The unfinished *Cascos* were broken up or left on the stocks. Another class of four giant seagoing monitors, the *Kalamazoo* class, which had been laid down late in 1863, was also left on the stocks, where after several years the ships were broken up.

In 1868 Congress authorized the Secretary of the Navy to sell all the remaining monitors in the Navy except the *Dictator,* the *Passaic* class, the *Miantonomoh* class, and the incomplete *Kalamazoo* class. The first monitors disposed of under this authority, the *Catawba* and the *Oneota* (*Canonicus* class), were sold to Peru, which at that time was at war with Spain. The intention of the Peruvians was to fit out these ships at New Orleans and use them to attack Havana, and preparations were actually begun. The war between Spain and Peru ended before they could be used. Needless to say, the attitude of the United States Government (which was at that time the *Alabama* claims against Great Britain) in this matter was somewhat negligent.

The *Miantonomoh*'s voyage to Europe, and the *Monadnock*'s similar voyage around the Horn to California, convinced many foreign naval leaders of the monitor's seaworthiness. Both Sweden and Russia built fleets of single-turreted monitors for service in the Baltic, and eventually England and France experimented with them, too.

In 1898 five monitors of the original *Passaic* class were taken out of retirement, refitted, and sent up and down the coast to serve as a harbor defense force against the Spanish Fleet. The last of these was scrapped in 1905.

The Mississippi River Ironclads

The *Monitor* and its sisters belong to the main current of naval development. Even if they had never fired a shot in anger, they still would occupy a significant place in the history of ships.

This is not the case with the ironclad gunboats built for the Mississippi Flotilla. On the whole, these ships were rather badly designed —some were hardly designed at all. They came into being almost effortlessly, or so it seemed, and exactly when they were needed. With the war won, they were quickly disposed of, and before long almost forgotten. Nevertheless, they were successful in the best sense; they were produced quickly from available skills and materials and used with imagination to accomplish the task assigned them: that of dominating the Mississippi Basin.

The principal figure in the development of the ironclad river fleet was James B. Eads, of St. Louis. Eads was a self-made businessman with a flair for engineering. His father died when he was thirteen, and Eads went from a small town in Indiana to St. Louis to seek his fortune, becoming successively a riverboat pilot, a partner in a steamboat salvage operation, and, in 1845, the proprietor of a highly successful glassware factory, the first in the Mississippi Valley. In 1855, poor health had forced him to retire from business.

Three days after the fall of Fort Sumter, Eads received a letter from Edward Bates, a close friend, and Lincoln's Attorney General. Bates told him to be prepared to go to Washington. "In a certain contingency it will be necessary to have the aid of the most thorough knowledge of our Western rivers and the use of steam on them, and in that event I have advised that you should be consulted." A telegram followed shortly and Eads hurried to Washington, where Bates told him of plans for a gunboat fleet to be built for service in the Mississippi theater of operations. He was introduced to other members of the Cabinet, including the Secretary of War, the incompetent Simon Cameron, as well as Gideon Welles and Gustavus Fox. Cameron was not particularly interested in the idea of building gunboats until the Navy Department entered the picture, with the appointment of Captain John Rodgers to work with Eads in planning the fleet. Then Cameron insisted that it was an Army responsibility. A compromise was reached whereby Cameron requested the Navy to lend Captain Rodgers to the Army, and he was sent on his way.

THE *CAIRO* CLASS: *CAIRO, CARONDELET, CINCINNATI, LOUISVILLE, MOUND CITY, PITTSBURG* AND *ST. LOUIS*

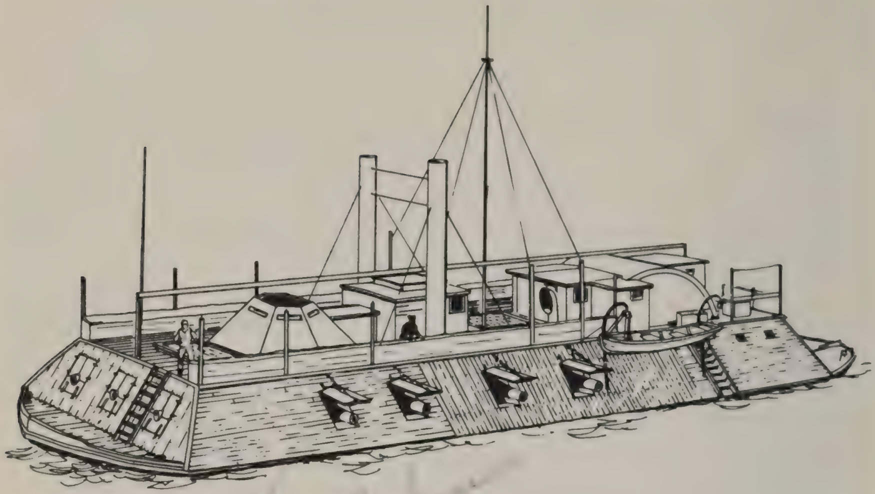
Captain Rodgers was not exactly a success. When Eads located the *Benton,* a stoutly built salvage boat he once had owned, and proposed to convert her into a warship, Rodgers vetoed the idea. The *Benton* later became the most powerful ship on the river. When Eads suggested purchasing Missouri riverboats and converting them in St. Louis, thereby avoiding the uncertainties of navigation on the Ohio at low water, Rodgers vetoed that too, and proceeded to go off to Cincinnati on his own, where he arranged the conversion of three steamers into wooden gunboats—the *Lexington,* the *Tyler,* and the *Conestoga.* The conversion of these, really amounting to not much more than adding heavy wooden bulkheads and some cannon, was completed by July, 1861, and the embryo flotilla started downriver to Cairo. As Eads had predicted, they were delayed by the low water, and did not reach Cairo for six weeks.

In the meantime, Eads had been making plans, and had drawn up a proposal of his own for a gunboat building program. In July, Quartermaster General Meigs advertised for bids, and, by some coincidence, Eads was low bidder. He was awarded a contract.

The contract called for the construction of 7 vessels which were to draw 6 feet of water. They were to be plated with iron and carry 13 guns each, and were to be delivered at Cairo, Illinois, on or before October 10 of that year.

The shipbuilding industry in St. Louis by that time had come to a virtual halt because of the war. Eads had no difficulty obtaining the materials, facilities, and labor necessary. He quickly organized an elaborate network of subcontractors throughout the Ohio Valley: the rolling mills of Gaylord and Sons in Portsmouth, Ohio; Swift and Company Newport, Kentucky; Harrison, Chouteau and Valle, in St. Louis; Thomas G. Gaylord, Cincinnati. Orders and instructions were sent by telegraph, often for hours at a time. At Cairo and Mound City, Illinois, and St. Louis, a force of 4,000 men worked night and day on the hulls while the 21 steam engines and 31 boilers necessary were being built.

The ships were not delivered on time. This was due to the government's failure to pay for them as promised—forcing Eads and his associates to buy materials and labor out of their own funds.

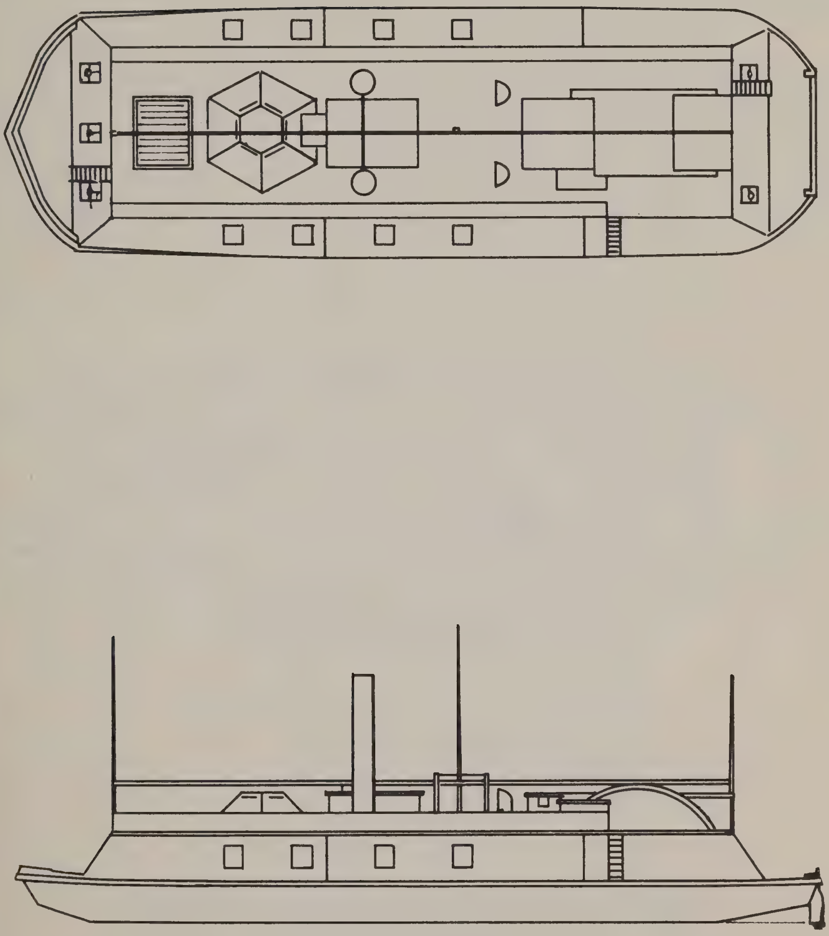


The *Cairo* Class

The *St. Louis,* the first of the seven, was launched October 12 at Carondelet, Illinois, 45 days after laying the keel.

There was certainly nothing radical about the design of these ships. On a more or less standard riverboat, hull 175 feet long and 75 feet wide, a casemate with sides sloping back at 45-degree angles was built. This casemate extended the full width of the boat and almost the complete length, leaving only the blunt bow and 10 feet or so of the stern uncovered. Within the casemate were the guns, three in the bow, pointing ahead, four on each side, and two astern. The paddle wheel was located in a well near the stern, and was completely surrounded by the casemate. Only the forward side of the casemate and a section of the sides abreast of the boilers and engines were armored, and here there were only 2½ inches of railroad iron. The rest of the casemate was backed with 24 inches of oak.

The boilers were dropped into the hold as far as possible, but, like those of most riverboats, they were high-pressure boilers. When hit they would explode like bombs, scalding anyone within the compartment with superheated steam.



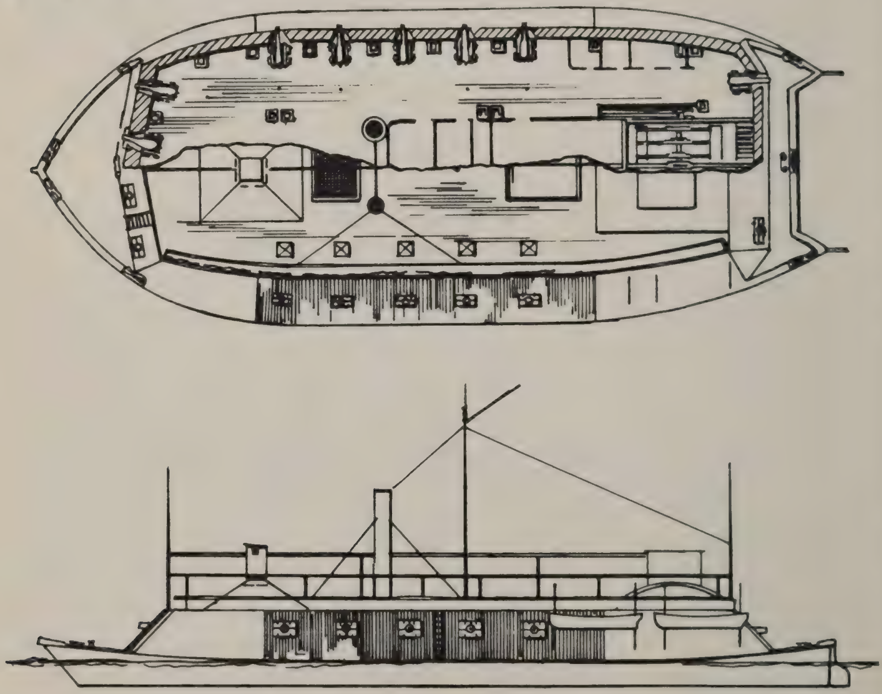
The *Cairo* Class (Plan)

THE *BENTON* AND THE *ESSEX*

Before the seven gunboats were completed, Eads undertook to convert two snag boats[*] into ironclads. The first became the redoubtable *Benton,* for some time flagship of the Mississippi Flotilla.

The snag boat was really a catamaran, with its twin hulls about 20 feet apart. The open space between the hulls was planked over, top and bottom, and a new bow added, forming a strong single hull 75 feet wide and 200 feet long. Upon this was built the usual casemate, only on the *Benton* the sides were armored as well as the bow with 3½ inches of iron. She carried 16 guns. With all this armor she was somewhat overloaded, and her top speed was only 5 knots.

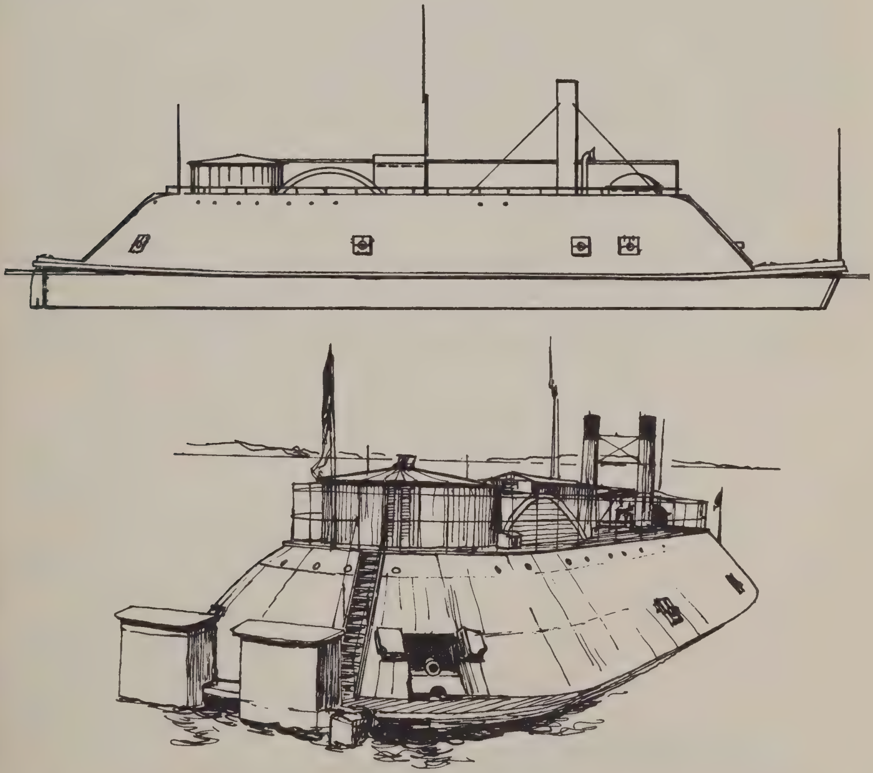
[*] Heavily built salvage boats, with powerful engines, also used for removing obstructions and towing.



The *Benton*

A second snag boat was converted into the *Essex*. Although she was as large as the *Benton,* she carried only 5 guns, and was even slower. She was an unlucky ship, always hard hit, in trouble of some sort, missing the big opportunities, somewhat like the *Saratoga* in the Second World War.

Slow and lightly armored as they certainly were, these 9 ships were the work horses of the Mississippi Flotilla throughout the war. As happened with the building of the monitors in the East, production slowed as the war progressed. This was caused by the shortages of labor and materials, as well as the burgeoning bureaucracy of the Navy Department.



The *Essex*

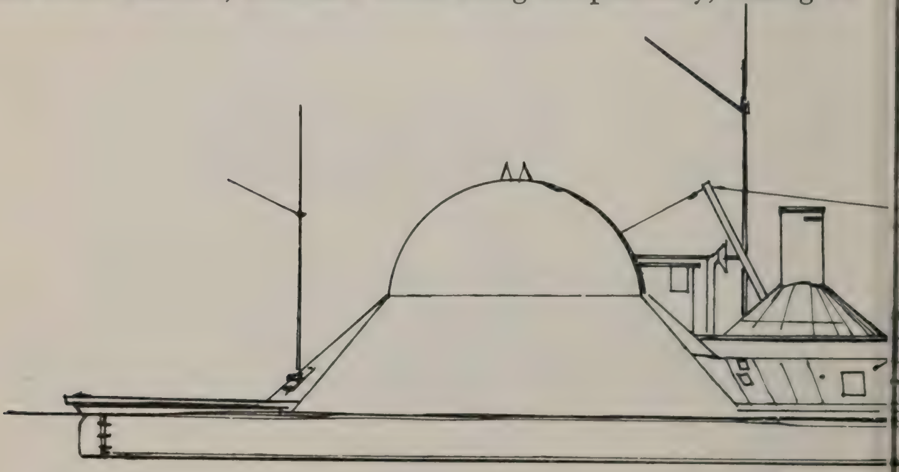
THE *CHOCTAW* AND THE *LAFAYETTE*

The nine gunboats of Eads 1861 program were a complete success from a tactical and strategic point of view. The fall of Fort Henry and of Fort Donelson, Island No. 10, and the dazzling naval success at Memphis seemed to promise complete victory in the near future. More gunboats were needed, and quickly, to maintain the momentum of the advance.

The Mississippi Squadron was still under the over-all direction of the Secretary of War. These hectic days saw the organization of a rival fleet of river steamers converted to rams under the command of Colonel C. R. Ellet of the Army, and the building of a number of improved armored gunboats, contracted for by the War Department for use by the Navy. The essential requirement was speedy construction of ships to serve until the monitors could make their appearance.

The most powerful examples of these "second generation" gunboats were the *Choctaw* and the *Lafayette*, 280 feet long, designed by Commander William Porter, David Porter's elder brother, who was serving under Flag Officer C. H. Davis of the Mississippi Squadron, and built by Eads in St. Louis.

The hulls were purchased, and, like those of the *Benton* and the *Essex*, were of strong and serviceable "prewar" construction. They were side-wheel steamers, with each wheel acting independently, making for

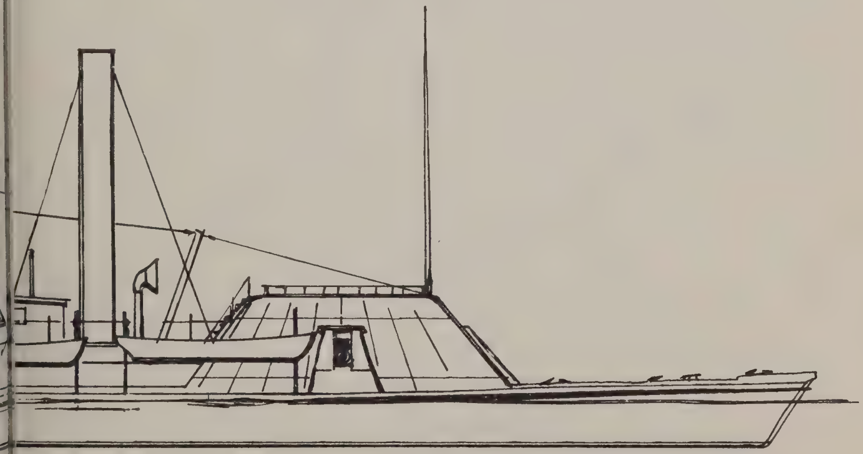


better steering and control in the confined waters of the Mississippi system, although the paddle wheels were somewhat exposed.

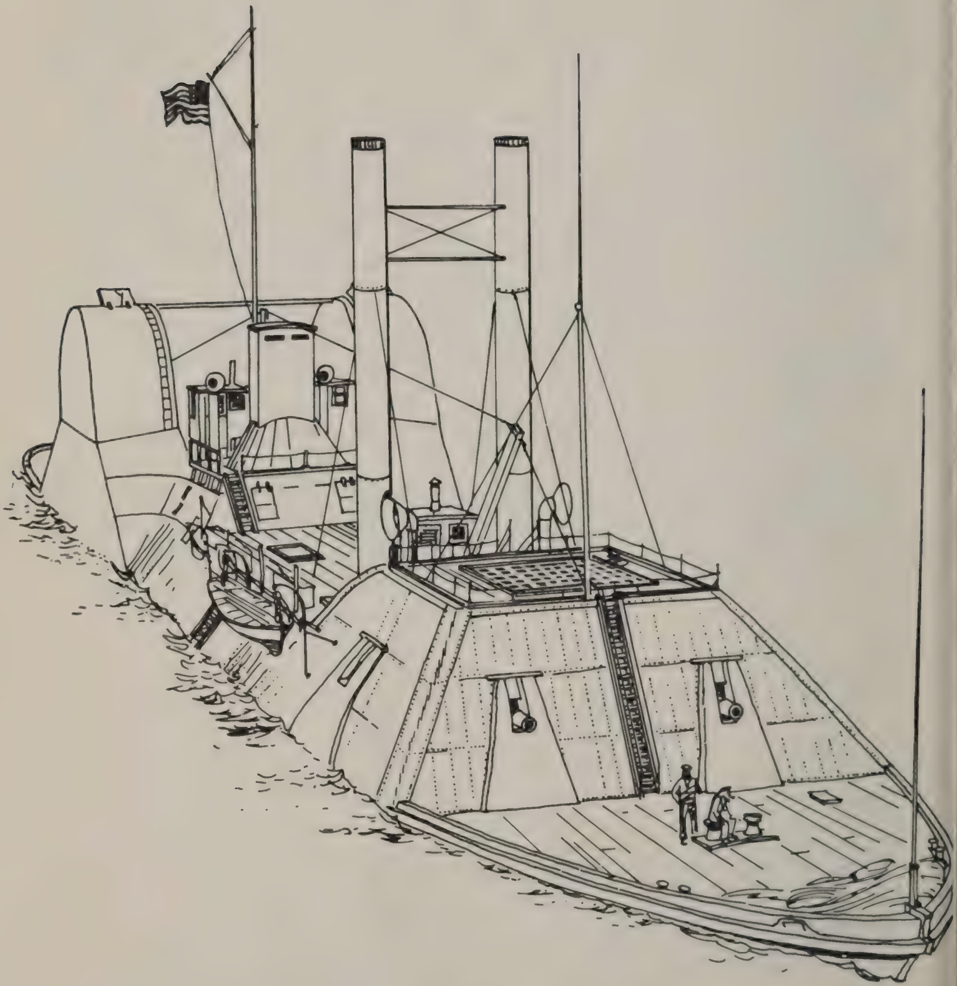
The *Choctaw* had a massive casemate forward, containing three 9-inch smoothbores and one 100-pound rifle. Just forward of the wheels was another casemate containing two 24-pound howitzers pointing forward. These were intended to command the deck aft of the casemate in case of boarding. There also were two 30-pounder Parrott rifles pointing aft.

The *Lafayette* was similar except that the forward casemate was carried all the way aft to the wheels, with two 11-inch bow guns pointing forward and four 9-inch guns in broadside, with two 100-pound rifles pointing aft. The *Lafayette*'s casemate was quite rounded, forming almost a half dome on the side facing the bow. The armor consisted of 1 inch of iron over 1 inch of gutta-percha, or India rubber. Great things were expected from this construction—the shot was supposed to bounce off In actual practice, however, the gutta-percha soon rotted and was worse than useless.

Both of these gunboats performed useful service in spite of their obvious shortcomings. They were in service by November, 1862, and by then there were no Confederate gunboats of any consequence left on the river. They were, however, adequately tested by Confederate forts along the shores.



The *Choctaw*



The *Choctaw*

THE *CHILLICOTHE*, THE *INDIANOLA*, THE *TUSCUMBIA*

Built by Joseph Brown of Cincinnati, in the spring of 1862, these three gunboats followed the same general plan as the *Choctaw* class, but they were somewhat smaller and rather poorly built. In a report to Gideon Welles, Rear Admiral David Porter adequately summed them up:

"The builders never claimed that they should be considered more than temporary expedients with which to harass the enemy; and taken in that sense, they certainly may be considered very good vessels, and have fairly repaid all the money spent on them, taking into consideration the work that they have done."

Porter might have gone on and compared their cost, slightly more than $900,000 for the 5 ships, with the more than 14 million dollars wasted on the *Casco* class monitors!

THE *EASTPORT*

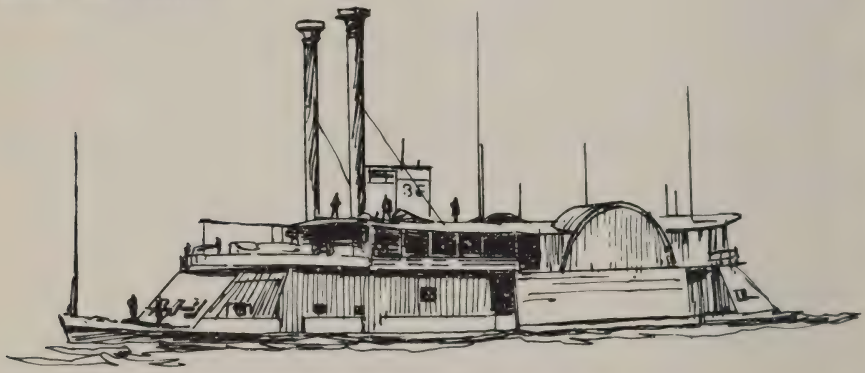
On February 7, 1862, three Union gunboats—the *Lexington*, the *Tyler*, and the *Conestoga*—made a daring foray deep into Confederate territory, ascending the Tennessee River all the way to Muscle Shoals in Alabama. At Cerro Gordo, in Tennessee, the force seized three Confederate steamers without opposition. One of these was the partially completed Confederate gunboat *Eastport*, a splendid stern-wheel steamer 280 feet long. Not only was the gunboat captured, but the Union raiders also came away with a quantity of armor ready for installation, and some 250,000 feet of lumber. The amount of disorganization in the Confederate forces in this area in the spring of 1862 was incredible, and it is one of the greater tragedies of the war that the Union forces were not in a position to take fuller advantage of it.

The *Eastport* was taken to Cairo, Illinois, which had become a major Union navy yard, and during the summer of 1862 she was completed. Eventually she was equipped with two 100-pounder Parrott rifles, two 50-pounder Dahlgren rifles, and four 9-inch Dahlgren smoothbores.

In August, 1862, she was commissioned in the United States Navy and almost immediately became the flagship of Captain Charles H. Davis, at that time in command of Union Naval Forces in Western Waters. Her speed was somewhat greater than that of the usual ironclad gunboat.

The *Eastport* quickly became one of the "heavies" of the Union naval forces on the Mississippi, participating in most of the heavy fighting. In March, 1864, the *Eastport* ran aground in the Red River during the course of operations against the Confederate ground forces, and had to be blown up to prevent her from being captured.

THE "TINCLADS"



A Typical "Tin Clad"

In the fall and winter of 1862, approximately 20 vessels of a new type were added to the river fleet—the so-called "tinclads." These were small river steamers, usually stern-wheelers, purchased in the cities along the river, sometimes by the War Department and sometimes by the Navy. They were armored with ½ to ¾ of an inch of iron, with extra protection around the boilers, and they often carried an armored pilothouse. The sides were pierced to accommodate from 4 to 6 guns, usually 24-pound brass howitzers, and sometimes 2 rifled guns in the bow. They were of extremely light draft, usually not more than 3 feet, and some of them drew as little as 18 inches. These boats were capable of cruising up and down all the tributaries of the great river, harassing the Confederates, particularly the guerrillas operating behind Union lines. A number of the tinclads patrolled the Tennessee and Cumberland rivers, convoying supply steamers and fighting bushwhackers. Twenty-two tinclads were put into service in 1862, and by the end of the war more than sixty had been used.

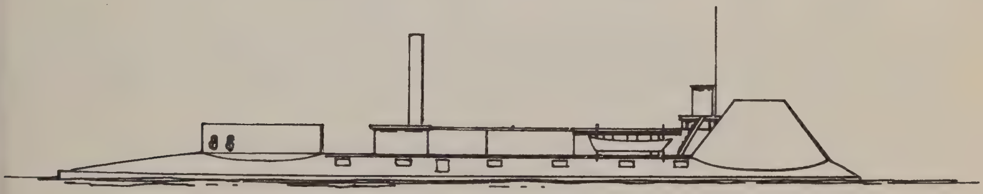
THE *OSAGE* AND THE *NEOSHO*

In April of 1862, the Navy Department requested Eads to submit plans for a light-draft, fully armored vessel. He responded with a design similar to the *Cairos,* with a casemate and a draft of 5½ feet. By this time the *Monitor* had burst upon the scene, and the department now wished to see turrets and still less draft. Eads then submitted a design with a turret 8 inches thick, an armored stern paddle wheel, and a 4½-foot draft. The department was impressed, but wanted even less draft, so Eads gave them a design drawing only 3½ feet. This was acceptable, and the following month Eads received a contract to build two of this type, the *Osage* and the *Neosho.*

While they were designated as monitors, they did not really conform to the Ericsson pattern, although a modification of the Ericsson turret was used. The difference primarily was in the placement of the turret; it was quite far forward with a field of fire of only about 300 degrees. The armored overhang also was lacking, and the deckhouses and the conical armor on the stern wheel must have made John Ericsson gnash his teeth. But all this was necessary to achieve the shallow draft.

Admiral David Porter, who was something of a connoisseur of monitors, pronounced them satisfactory for light work, but not at all suitable for rough weather or heavy combat. He did not recommend building any more of them.

Still they did meet the light-draft requirement, unlike the more sophisticated *Cascos.* In fact, when they were launched, they drew only 3 feet, and so an extra ½ inch of iron was laid on their decks.

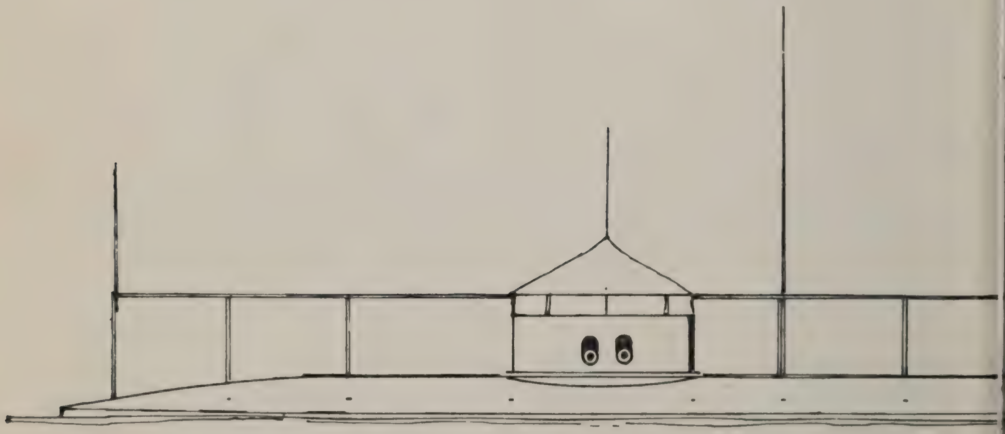


The *Osage* Class

THE *WINNEBAGO* CLASS: *MILWAUKEE, WINNEBAGO, KICKAPOO* AND *CHICKASAW*

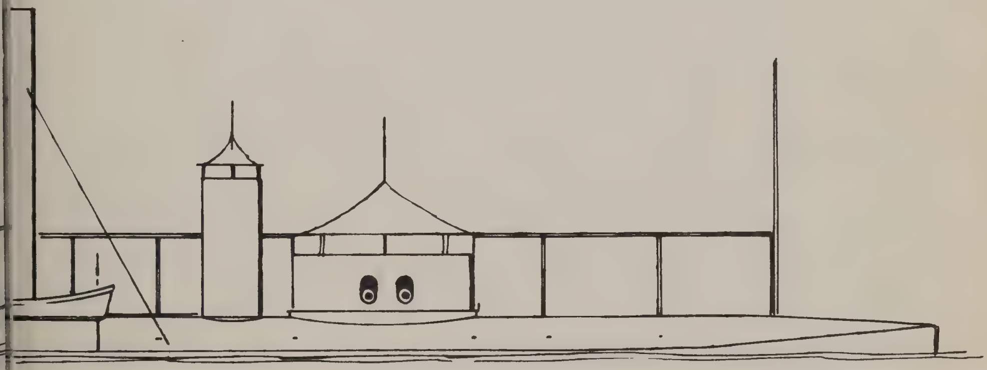
In May, 1862, shortly after contracting for the *Osage* and the *Neosho,* the Navy Department awarded contracts for four more shallow-draft monitors. These were to be double-turreted, screw driven rather than by paddle wheel, carrying four 11-inch guns. The first two were to be built by Eads, the *Kickapoo* by G. B. Allen and Company of St. Louis, and the *Chickasaw* by Thomas G. Gaylord of Cincinnati.

Eads's turret design, which he had submitted for use on the *Osage* and the *Neosho,* was now accepted by the Navy. One of the twin turrets on each ship was to be an Eads type. (This design was quite successful and became the progenitor of many turret designs after the war.)



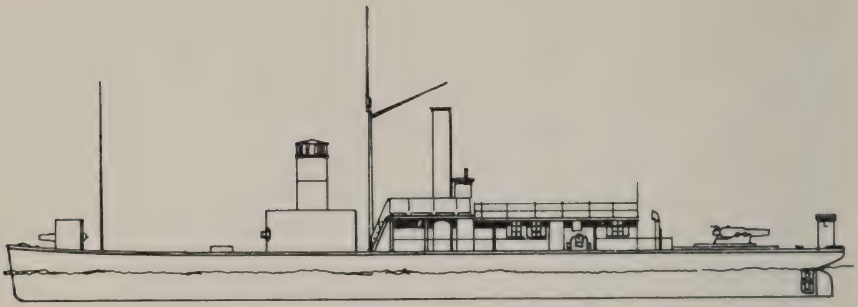
The turret made extensive use of steam power to elevate and depress the guns, check the recoil and return the gun to battery, and to open and close the gunports. The problem of hoisting ammunition was solved by mounting the guns on a piston, which was fitted into a vertical cylinder, permitting the guns themselves to be lowered into the hold, then loaded and raised into position. The turret, extending down into the hold, revolved on 6-inch iron spheres in a circular groove.

The general arrangement of the *Winnebago* class has been followed by virtually every warship since. Ericsson's obsession, the 360-degree field of fire, which was so doctrinaire and limiting, was replaced with the fore-and-aft battery, with the fire control tower and the stack amidships. The decks of this class was turtlebacked, which seems also to have been an Eads trademark.



The *Winnebago* Class

THE *OZARK*



The *Ozark*

At the same time a contract was awarded to George C. Bestor of St. Louis for a somewhat similar monitor, the *Ozark*. This ship turned out to be a rather curious hybrid, with an Ericsson turret forward mounting two 11-inch smoothbores, a 12-pounder pivot gun aft, and three 9-inch smoothbores, one in the bow and one on each side. Instead of the stern paddle wheel, the *Ozark* was powered with twin screws. [For some reason, this ship always is listed as being part of the *Osage* class, although there was absolutely no resemblance between it and the *Osage*.]

The *Ozark* was commissioned in February, 1864, in time to take part in the ill-starred Red River campaign the following summer, along with the *Osage* and the *Neosho*. By that time, of course, there virtually was no Confederate naval force left in the Mississippi area, and the ship never was put to any serious test. Porter did not consider her any better than the *Osage* or the *Neosho*.

The naval war on the Western Rivers was completely unconventional with comparison to any naval war before or since, and will remain unique for all time. There was only one fleet action—the Battle of Memphis, Tennessee, on June 5, 1862.

After having reduced the Confederate bastion at Island No. 10 by a combined land and naval assault on April 7, a Union flotilla under the command of Flag Officer Foote worked its way down to Memphis. A detachment of Confederate Flag Officer George N. Hollins' River Defence Fleet was engaged briefly near Fort Pillow, Arkansas, on the 11th of April and again on May 10th. The Union force consisted of six of the *Cairo* class gunboats and the *Benton.* In the action of May 10th, the *Cincinnati* was sunk and the *Mound City* driven aground by Confederate rams. Both ships were repaired and returned to service within a month—another unique feature of this strange war: barring a major explosion or fire, it was quite feasible to raise and restore sunken ships.

At Memphis, the Confederate River Defence Fleet consisted of eight unarmored rams, mounting from two to four guns each, and the Union flotilla was made up of five armored gunboats—the *Benton,* the *Louisville,* the *Carondelet,* the *St. Louis* and the *Cairo.* In addition, there were two of Colonel Ellet's rams, the *Queen of the West* and the *Monarch.*

After their experience with Confederate rams at Fort Pillow, the Northerners approached warily, and the two Ellet rams made the initial assault on the Confederate line.

At first the battle was an even one. The *Queen of the West* sank the Confederate *Lovell,* and was in turn rammed and run aground by the *Beauregard.* The tide was turned when two Confederate rams, bent on charging the *Monarch,* collided. One of them, the *General Sterling Price,* was completely wrecked and had to be run aground. The other was then rammed by the *Monarch.* The remaining Confederates fled down river, pursued by the Union rams. Only one Confederate ram escaped. Memphis surrendered that day, and with its fall went any Confederate hopes of naval superiority on the Mississippi. Although facilities for constructing ironclads existed on the Yazoo and other tributaries, and attempts were made to build a fleet by the Confederates, Union predominance in ironclads was absolute. The urgency of James Eads had paid off.

At the end of June the Union flotilla, now under the command of Flag Officer Charles Davis, steamed down river and two days later joined forces with Farragut's ships, which had come up from New Orleans and had successfully passed the feeble fortifications at Vicksburg. The tributary White River had in the meantime been opened up by Union gunboats (with the loss of the *Mound City*) as far as St. Charles, Arkansas.

The Union supremacy was briefly challenged in July, 1862, by the appearance of the Confederate ironclad *Arkansas*. (The career of the *Arkansas* will be covered in more detail in Part III.) While causing no little embarrassment and chagrin to the Union commanders, her efforts were of slight importance, except in that she bought the Confederates at Vicksburg an additional month in which to fortify the city. With the destruction of the *Arkansas* by the *Essex* early in August, the Confederate Navy virtually gave up the ghost on the Mississippi.

For the remainder of the war, Union forces, their strength constantly augmented by new construction, engaged in combined operations against Confederate shore positions. This fighting was grim and hazardous, and many ironclads were sunk and damaged. The *Cairo* was sunk by mines in the Yazoo River, while engaged in operations against Vicksburg on December 12th, 1862. The *Indianola* was sunk after having attempted to destroy the *Queen of the West,* a Union ram captured by the Confederates on the Red River in February, 1863. The damage suffered by the other gunboats during this period was considerable, but they were usually quickly repaired and returned for more service. With the fall of Vicksburg in July, 1863, there was little left to do for the gunboats on the Mississippi itself. A force was then sent up the Yazoo River to raid the Confederate base to Yazoo City. Although Confederate resistance was feeble, there were still mines in the river and another *Cairo* class gunboat, the *Baron de Kalb* (formerly the *St. Louis*) was sunk.

Similar raiding expeditions were sent up the Red River, and again up the White River, which had once more become infested with Confederates.

In the meantime, the Tennessee and the Cumberland Rivers were patrolled by the "tinclads," primarily to control Confederate guerrilla activity.

In March of 1864 a powerful force of ironclads was sent up the Red River, where a Confederate buildup had prompted a major Union land expedition, which included 10,000 troops under the command of General Nathaniel Banks.

The loss of the *Eastport* and the *Ozark* during this expedition was really not too serious in view of the Union superiority in ironclads, but on the 30th of April, 1864, the Red River, which normally remains high enough for navigation until late in June, was found to have fallen to the point where the Union force could no longer return downstream. A minimum depth of 7 feet was required, and on the 30th of April the river's depth measured only 3 feet 4 inches. The trapped gunboats included the *Mound City* (raised and repaired after her demise in the White River), the *Carondelet,* the *Louisville,* and the *Pittsburg,* as well as the *Ozark,* the *Neosho,* and the *Osage.* Ashore, the forces of Union General Banks were being constantly pressed by the Confederates, and had already begun to retreat. Although Banks had a garrison at Alexandria, Louisiana, not far from the position of the stranded gunboats, it was doubtful that he could protect the gunboats from attack for long. An ignominious defeat, and one of major proportions, faced the Union Navy.

At this point, the Chief Engineer of the Union Nineteenth Army Corps, Lieutenant-Colonel Joseph Bailey, came to the rescue. Bailey, a Wisconsin lumberman, proposed to save the ironclads by building a dam across the river, thus raising the water level over the shallows enough to permit the ships to proceed. Although his idea was viewed with some skepticism, it was decided to try it. While the ironclads were lightened by the removal of their guns and armor, a dam of logs and stones was built by the Army. This dam, almost 800 feet wide, was finished in eight days by shifts of from two to three thousand men. The center of the dam was plugged with four large coal barges, and when the water had risen, its pressure finally swept the barges away. Some of the Union ships rode the torrent through the gap in the dam and emerged into deep water and safety. The dam was then repaired after a fashion and the remaining ships got through. Below the dam the ironclads replaced their guns and armor, which had been carried along the shore by wagons.

The Red River Expedition was a failure, although not really of any great significance. The main Union thrust was towards the east by this time, and so the Confederate forces in Arkansas and Western Louisiana were simply blockaded and left to wither on the vine.

The *Carondelet,* the *Neosho* and a number of tinclads were sent north to the Cumberland River, where they aided Union ground forces in the defense of Nashville, in December, 1864. Aside from this, there was little left to do on the inland waters except to harry Confederate guerrilla forces.

The *Winnebago* class monitors, which had arrived too late for any action on the river, were also sent to the Mobile area. Here the *Winnebago* covered herself with glory in the action against the great Confederate ram, the *Tennessee*, as did her sister, the *Chickasaw*. Soon after the battle, the *Kickapoo* and the *Milwaukee* made their appearance at Mobile. In subsequent operations against Confederate forts, both the *Milwaukee* and the *Winnebago* were sunk by mines.

The *Osage* and the *Cincinnati* also appeared briefly in the Mobile area, engaging in mopping up operations after the Battle of Mobile Bay.

At the end of the war the Mississippi flotilla was quickly disbanded. The ships were sold and the officers and men, who were largely volunteers, returned home. The war they had fought and won has no parallel in history. Its nearest counterpart is possibly the campaign which began in the Solomon Islands and worked up to the Philippines in the Second World War. In any case, it seems peculiarly American, in the manner in which conventional naval tactics, organization and ships were adapted to the needs of the moment.

"Conventional" Ironclads

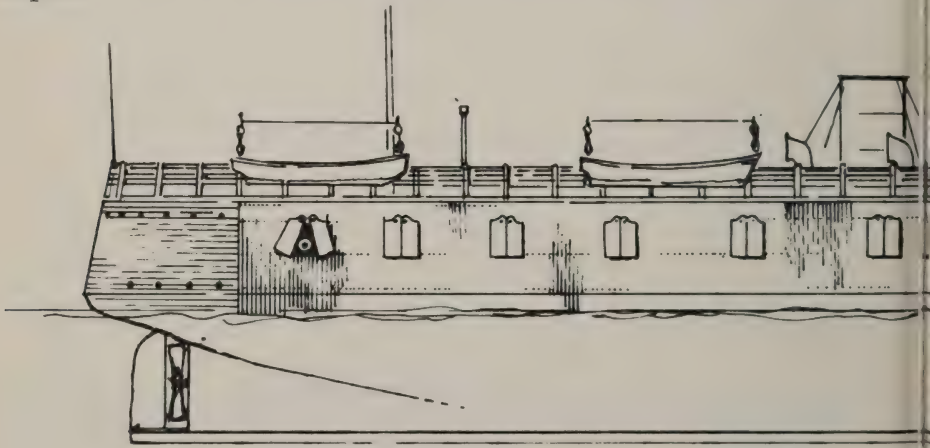
While the monitors and the armored river gunboats occupied the attention of Union naval authorities to a considerable degree, the seagoing casemate or broadside ironclad was not entirely ignored. The merits and characteristics of the French and British ironclad frigates were well known in naval circles in the United States.

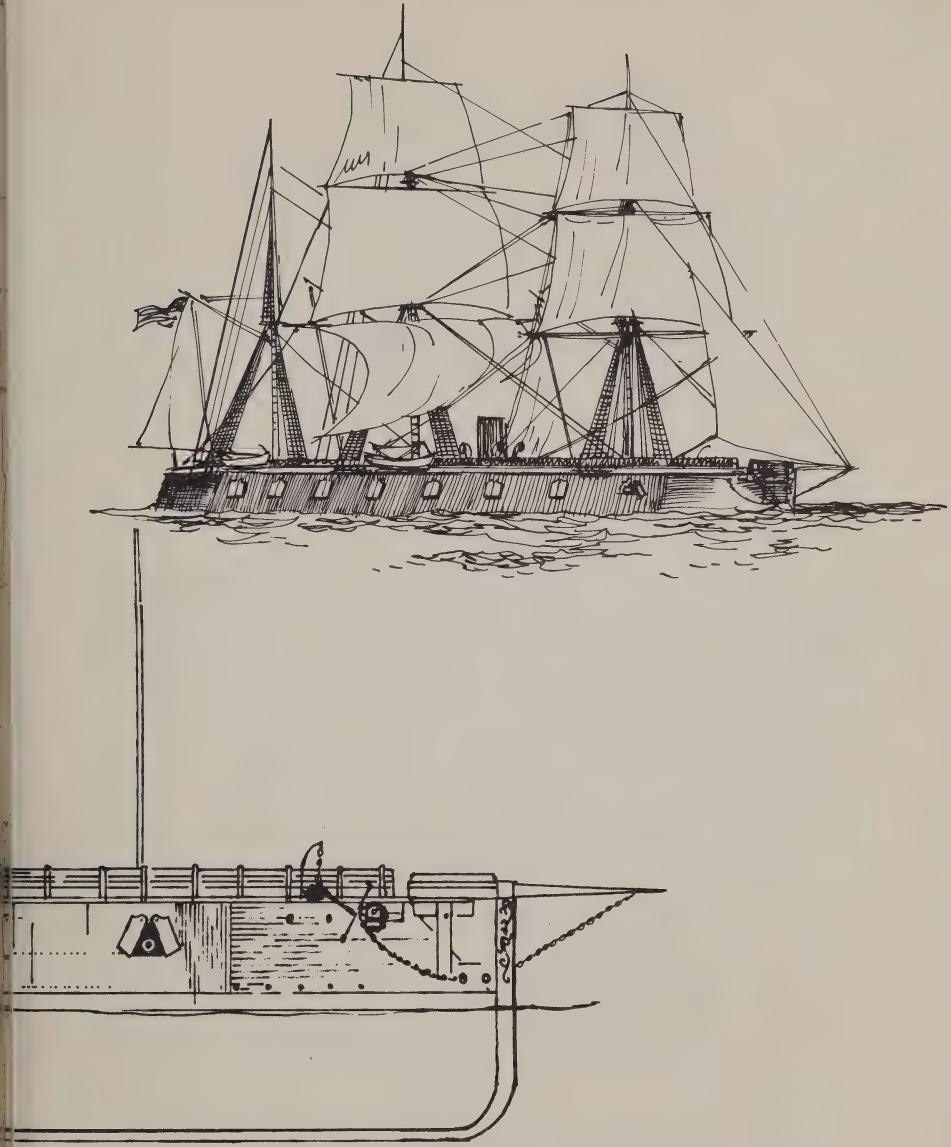
In the main, however, construction of this type of vessel received a low priority, due mostly to the enormous and more pressing requirements for other types; fast wooden cruisers to hunt Confederate raiders, transports, shallow-draft gunboats, torpedo boats, and of course monitors and more monitors.

THE *NEW IRONSIDES*

The same board of officers which took the momentous step of recommending the construction of the *Monitor* also recommended the acceptance of two other designs; that of the *Galena,* which was a failure, and that of the *New Ironsides* which, practically speaking, was a complete success.

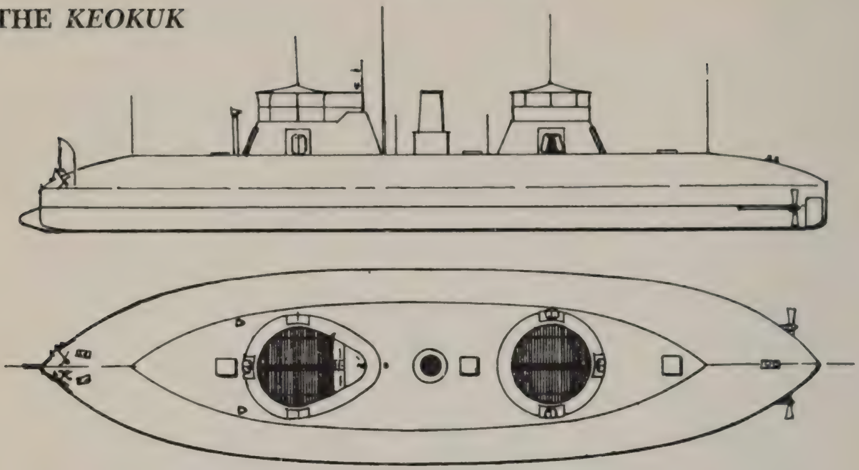
The design of the *New Ironsides* was based wholly on that of the French *Gloire* and the British *Warrior:* solid, conventional construction of wood, conventional rigging and engines, armor amidships protecting the guns and the boilers. The speed was only 6 knots, but then it was not anticipated that she would have to run away from any ship in the world. The *New Ironsides* also carried a ram on the bow. In terms of contemporary shipbuilding techniques, the *New Ironsides* was easy to build. She was completed without incident late in 1862 and assigned to the siege of Charleston, where her 11-inch guns fired thousands of rounds at the forts in the next two years. She was hit hundreds of times, and survived, with no serious damage, an attack by what was possibly the most deadly weapon of the naval war—a Confederate torpedo boat. The *New Ironsides* was built by C. W. Merrick and Sons, of Philadelphia, with the white oak hull provided by Cramps Shipyard, also of Philadelphia.





The *New Ironsides*

THE *KEOKUK*

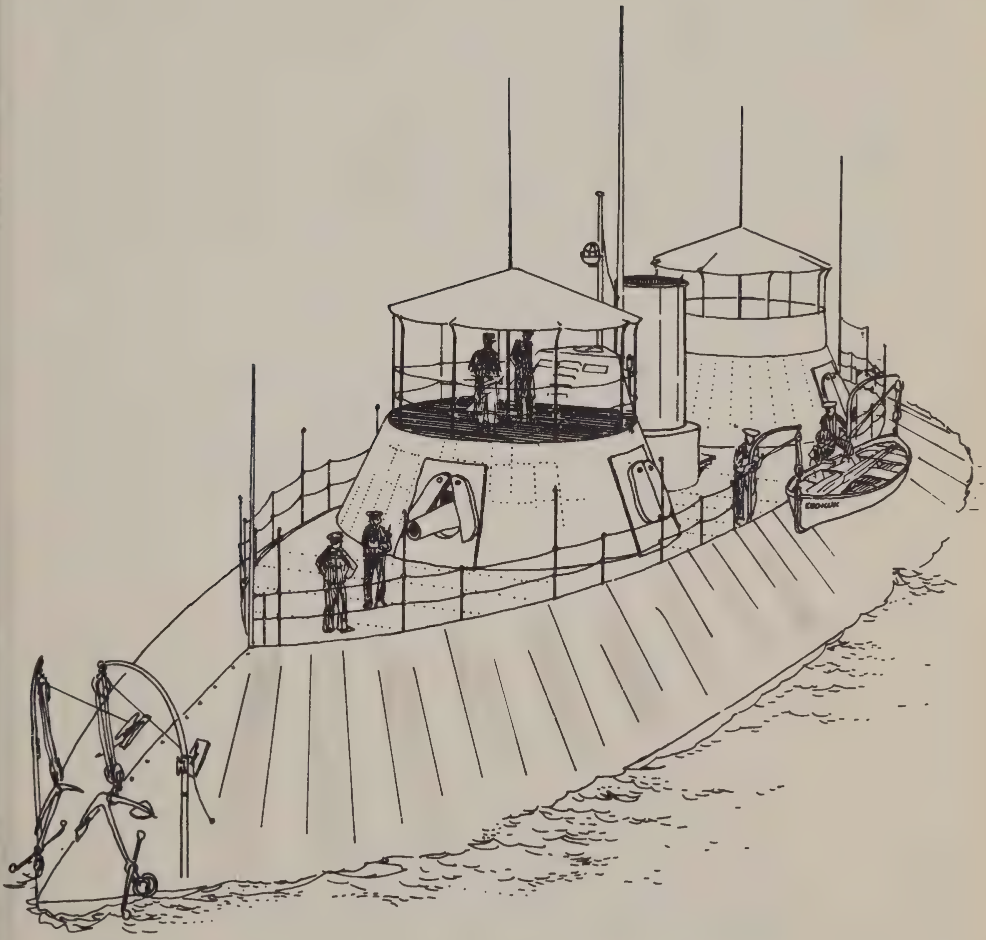


The *Keokuk*

The *Keokuk* in many ways represents the complete antithesis of the *Monitor* concept. One is tempted to wonder what would have been the result if the *Keokuk* had been selected as a prototype instead of the *Monitor.* Just possibly she might have survived an encounter with the CSS *Virginia,* and had a fleet of *Keokuks* been sent out against the Confederates . . .

Whereas the hull of the *Monitor* was low and flat, that of the *Keokuk* was high and sloping; instead of one heavily armored rotating turret with two guns, she had two lightly armored nonrotating, nearly circular casemates, each sheltering one 9-inch pivot gun, which could fire only through one of three ports at 90-degree angles; instead of one simple engine and one large propeller, she had two extremely complicated engines driving two small propellers; instead of one completely protected anchor, she had two ridiculously exposed ones. Her armor was bizarre—alternate courses of 4-inch iron and wood. Withal, she was oddly beautiful. There was a kind of Victorian elegance about her which the Ericsson boats lacked.

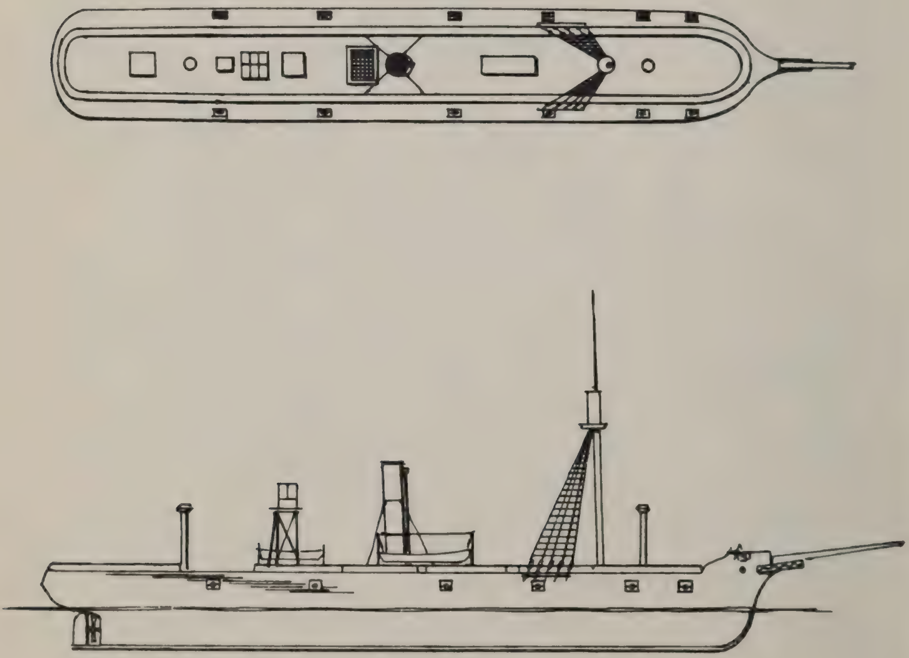
The *Keokuk*'s history was gallant and—short. Designed by C. W. Whitney, built by the Underhill Ironworks in New York City. Laid down April 19, 1862, launched December 6. Commissioned February 24, 1863, sunk at Charleston, South Carolina, on April 8, after being hit 90 times.



The *Keokuk*

THE *GALENA*

The third ship recommended by the board was the *Galena*. By all accounts she was a poor ship; in her first engagement, in the James River in 1862, she was badly knocked about by Confederate batteries. Throughout her career she had a poor reputation, although it is hard to see why. Her designer was S. H. Pook, earlier and later a naval constructor of note, and her builder was C. S. Bushnell, Ericsson's partner. Her construction was as conventional as the *New Ironsides*, with a 45-degree slope to her sides and 4 inches of armor. The engines were the Ericsson vibrating-lever type, used successfully in many ships, from the *Princeton* to the *Monitor*. Nevertheless, she was not successful; she served throughout the war and was present at Mobile Bay, but she gained no distinction.



The *Galena*

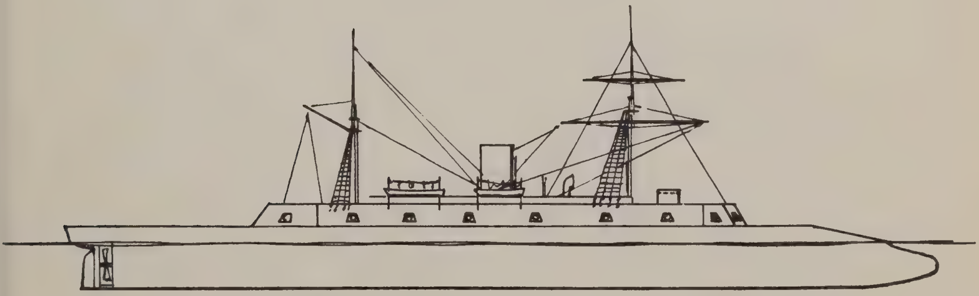
THE *DUNDERBERG*

While the principles of the *Monitor* were adopted wholeheartedly in the United States Navy after the action at Hampton Roads, and ultimately became the basis for all modern warships, the design principles of the CSS *Virginia* gained a more immediate acceptance in European navies. Primarily this was because the broadside battery, in addition to having the sanction of tradition, was simpler to build, maintain, and operate in terms of the technology of the day.

One ship of the *Virginia* type was built in the United States during the war: the *Dunderberg.* This ship possessed all the features of the Confederate ironclad: a low hull, a ram, and a sloping armored casemate. The contract for the *Dunderberg* was awarded to W. H. Webb, of New York City, on July 3, 1862. The wooden hull was built by Webb, and the engines subcontracted to John Roach, of the Etna Iron Works.

Although the wood and iron construction was hardly an innovation, the *Dunderberg* embodied a number of quite modern concepts, such as a double bottom, watertight compartmentation, and gratings in the smokestack to prevent debris from damaging the boilers.

The main engines were rated at 5,000 horsepower—giving a speed of 15 knots. Originally the intention was to mount two turrets on top of the casemate, but this idea was discarded in the final design.



The *Dunderberg*

The casemate itself was octagonal, permitting a greater coverage of fire than usually was found in a casemate vessel. The ram was 50 feet long and 7 feet thick at the base. With engines of 5,000 horsepower, the *Dunderberg*, when completed in 1865, was one of the most powerful warships in the world, and a considerable improvement in every respect over the *New Ironsides*, the only other American "battleship." She was not, however, destined for the United States Navy. With the ending of the war, interest in ironclads in the United States faded almost completely. The *Dunderberg* was sold back to her builders, who resold her to France in 1867. With her name changed to *Rochambeau*, she served many years in the French Navy, where she was an influence on French design as late as the 1890's.

Part II

Ironclads in the Confederate States Navy

In contrast to the initial hesitation in the North regarding the construction of ironclads, the Confederates, beginning with the very newly appointed Secretary of Navy, Stephen R. Mallory, were quick to see the possibilities of the new weapon. In a letter to the Chairman of the Naval Affairs Committee of the Confederate Congress, Mallory enthusiastically expounded his views:

"I regard the possession of an iron armored ship as a matter of the first necessity. Such a vessel at this time could traverse the entire coast of the United States, prevent all blockades, and encounter, with a fair prospect of success, their entire Navy. If, to cope with them on the sea we follow their example and build wooden ships, we shall have to construct several at one time; for one or two ships would fall easy prey to her comparatively numerous steam frigates—but inequality of numbers may be compensated by invulnerability."

In the following weeks Mallory moved to bring his scheme to reality. Lieutenant James H. North was ordered to proceed to London, and with the assistance of Confederate agents already in England, to go to France and open negotiations with the French for the purchase, either directly or indirectly, of one armored frigate of the *Gloire* class, or failing this, to arrange for a similar ship to be secretly constructed. Another armored ship was to be contracted for in England. Lieutenant North was advised to consult with Captain Cowper Coles, the Royal Navy's ironclad expert, before drawing up specifications. On May 20, 1861, 2 million dollars were allocated for the purchase of 6 armored vessels abroad.

Mallory's efforts to purchase warships abroad were to be largely frustrated by the Confederate lack of hard cash, and by British and French reluctance to commit themselves until they could see how the war would go. It was possible to buy commerce-raiding cruisers, which could be passed off as merely fast merchantmen, but the construction of an ironclad frigate could not very well be countenanced by any government wishing to preserve even a pretense of neutrality. Furthermore, both Great Britain and France had embarked on ambitious ironclad building programs of their own and were not eager to supply this type of vessel to foreign nations which might be arrayed against them in the future.

Mallory also took steps at the same time to get an ironclad program under way in the Confederacy itself. Captain Duncan Ingraham, recently resigned from the U.S. Navy, was ordered to make a survey of wrought-iron platemaking facilities in the Confederacy, and to ascertain means for transporting iron to New Orleans, the principal shipbuilding center. Ingraham's reports were not encouraging. There were ironworks aplenty in the South, but rolling mills were few and far between. One of the biggest, the mill of Daniel Hillman and Co., in Kentucky, was only 40 miles from the Ohio border, and Hillman was not willing to risk having his mill seized by the Yankees.

The only dependable mills were the Tredegar Works in Richmond, and the mill in Atlanta, Georgia. Nevertheless, by October, 1861, the Navy Department had contracted for more than 18,000 tons of iron, and for construction of a rolling mill in New Orleans.

Marine steam engines were, next to armor plate, to become one of the most serious problems of the ironclad program. No marine engines of sloop or frigate size ever had been built in the South, and facilities for making them did not exist. Eventually a large steam hammer capable of working the huge forgings necessary was salvaged from Pensacola Navy Yard and erected in Charlotte, North Carolina.

As such equipment became available, the shortage of skilled workers largely nullified its usefulness. Prior to secession, most of the skilled mechanics working in the South were either Yankees or foreigners, and their departure was severely felt. With conscription, large numbers of native workmen were removed from the labor market. The Confederate Army, like every army before and since, was generally unsympathetic to the argument that a mechanic was more valuable in a war plant than on the line, or even in camp marking time. As war production of all kinds mounted, the inevitable wage price spiral made its appearance, just as it did in the North. Chaotic economic conditions led to pirating of workers among contractors, and, in some areas, resulted in an absolutely ruinous system of piecework contracting by the day, whereby a workman could make 6 to 10 dollars a day (a good week's pay in those days) and be paid at the end of every day. Under these conditions, a worker could pick and choose his work as he pleased, or stay home and loaf if he felt that he had earned enough for the week.

To a much greater extent than the United States Navy Department, the Confederate counterpart was forced to build and manage industrial facilities of all kinds in order to get its work done at all. Before the end of the war, Mallory ruled an enormous industrial complex of ordnance factories, forges, powder plants, and even mines and smelters. Building this system in a predominantly agricultural country, in the face of Northern attacks literally from all sides, was a brilliant feat. It would be necessary to turn to the accomplishments of Germany in the Second World War to find a comparable performance under fire.

Before the end of 1861, contracts for ironclads had been awarded and construction of more than ten was under way all over the South, while in the North, except for the Eads river gunboats, only the *Galena*, *New Ironsides*, and *Monitor* were under construction.

With a very few exceptions, all the ironclads built in the Confederacy followed the same pattern so closely that it is unnecessary to deal with them in detail, at least from a design point of view. They did differ in details, such as size, armor, power plant, and armament, and some were more solidly built than others, but their advantages and defects were for the most part such as were inherent in the basic design.

The *Virginia* (ex *Merrimack*) is, of course, considered to be the model of the Confederate ironclad, but in many respects she was an exception, particularly in size, number of guns, and the fact that she was converted rather than built from the keel up. As one of the very first ironclads, however, she certainly may be considered the prototype of the others to come.

The basic ironclad design was the product of two Confederate naval officers, both formerly of the U.S. Navy, Lieutenant John M. Brooke and Naval Constructor John L. Porter.

Early in June, 1861, shortly after the capture of Norfolk, Brooke, inventor of the Brooke gun, met with Secretary Mallory and showed him sketches for a proposed ironclad, a project, as we have seen, very much on the Secretary's mind. Mallory was impressed, and, at Brooke's request, sent the naval constructor, John L. Porter, to assist him in drawing up plans for an ironclad to be built at Norfolk. Porter arrived with his own design and a model, embodying concepts similar to most of Brooke's ideas. Porter, with some assistance from another officer, Chief Engineer William Williamson,* had developed his ironclad design independently. Both designs made use of a rectangular casemate with slanting sides, pierced for guns on all four sides. Construction was of heavy timbers faced with iron plates. Porter's hull was a blunt, scow affair, much like the hull of Eads's *Cairo* class gunboats. Brooke contributed the long, low tapering hull with an iron ram on the bow which became characteristic of the Confederate ironclad. He further planned that the bow and stern sections be submerged about 2 feet under water. The *Virginia* followed this pattern; when under way only her casemate was visible above the water. Subsequent ironclads usually did not have this feature; their bows rode a foot or two above the water.

Compared to the conventional ironclad being built in Europe, and in the North, there is no question that the Confederate design was superior. The conventional ship, including the *New Ironsides*, was unarmored around the bow and stern, and, of course, had few guns pointing ahead and astern. The Confederate ships usually had only one gun pointing forward, but the powerful ram on the bow gave them a tremendous advantage. In adopting the low deck, visibility was improved, as it was feasible to build a low armored pilothouse atop the casemate.

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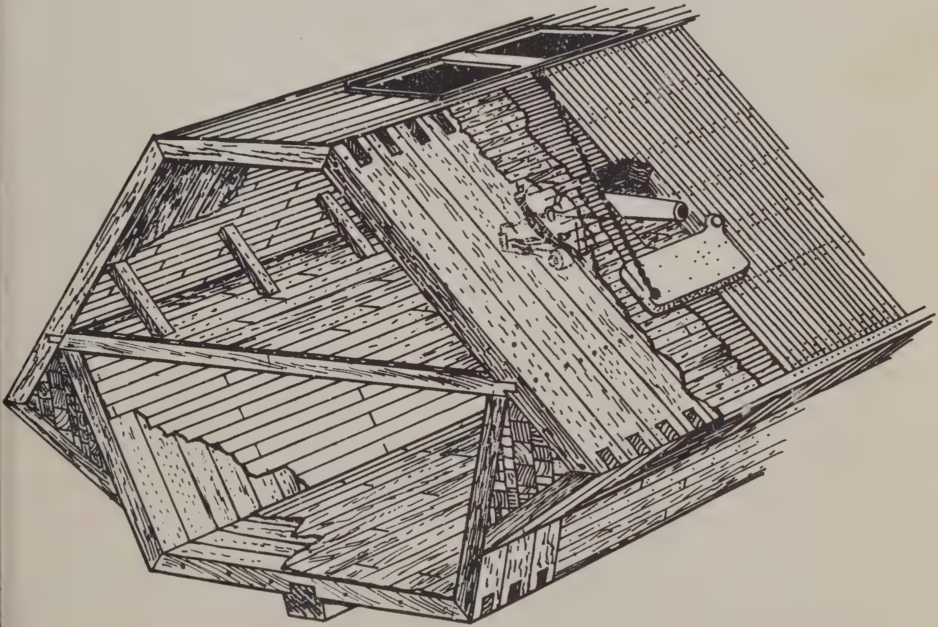
* Formerly the senior Chief Engineer, U.S. Navy.

In these respects the Confederate ironclad was an innovation, but it was not revolutionary. The most ingenious feature, and one which is in fact the basic measure of any design, but above all any design for an implement of war, was the simplicity of construction. The conventional hull of the period was a delicately curved structure requiring many calculations, quite sophisticated techniques for forming the ribs, and even specially selected parts of trees in order to give structural strength. The hesitation in using steam power to its fullest dictated an elaborate rigging and plenty of skilled seamen. The Confederate design made a complete break with all of this. The hull was flat-bottomed and flat-sided. These ships could be built wherever there was a plentiful supply of timber, even green wood. The building techniques were no more sophisticated than those required to build a house. Gilbert Elliott, builder of the *Albemarle,* and most of the other North Carolina ironclads, has given us an excellent description of the simplicity with which these ships could be built:



The Method of Constructing a Confederate Ironclad

"The keel was laid and construction commenced by bolting down across the center, a piece of frame timber 8 x 10 inches. Another frame of the same size was then dovetailed into this, extending outwardly at an angle of 45° forming the side, and at the outer end of this, the frame for the shield was also dovetailed, the angle being 35°, and then the top deck was added, and so on around to the other end of the bottom beam. Other beams were then bolted down to the keel and to the first fastened, and so on, working fore and aft, the main deck beams being interposed from stem to stern . . .

". . . When this part of the work was completed she was a solid boat, built of pine frames, and if caulked would have floated in that condition, but she was afterwards covered with 4-inch planking laid on longitudinally as ships are usually planked and this was properly caulked and pitched, cotton being used for caulking instead of oakum. The iron plating consisted of two courses . . . the first course was laid lengthwise . . . , a two inch space, filled with wood being left between each two layers to afford space for bolting the outercourse through the whole shield (casemate) and the outer course was laid flush, forming a smooth surface.

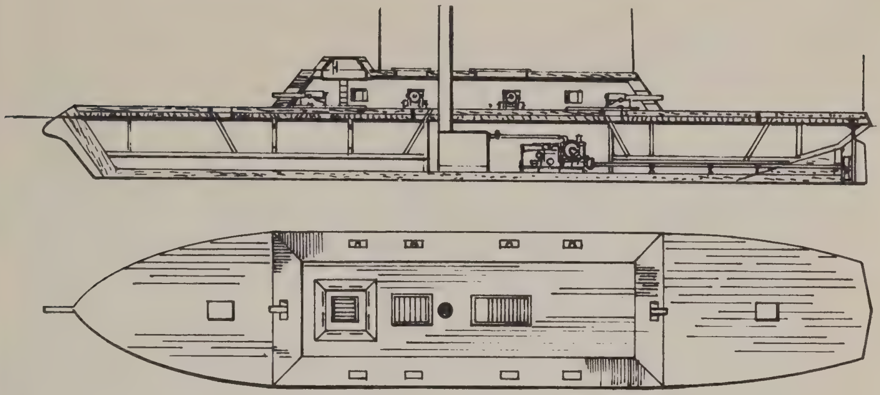
"The inner part of the shield was covered with a thin course of planking, nicely dressed, mainly with a view to protection from splinters. Oak knees were bolted in, to act as braces and supports to the shield.

"The sides were covered from the knuckle (usually) four feet below the deck."

The knuckle below the water line was quite similar in concept to Ericsson's armored raft, and caused the ships to steer badly for the same reason as did the monitors.

With adequate armor and decent engines, the performance of the Southern ironclads should have been equal to their objectives. These were lacking, however, and the designers may be criticized for not having taken this lack into consideration. A third source of trouble for Southern ironclads was their deep draft, averaging about 15 feet, acceptable for a strictly seagoing vessel, but a constant drawback for ships operating in rivers and shoal water.

Time and time again we find them running aground, unable to pursue a fleeing enemy into shallow waters (as in the case of the *Virginia* and the *Monitor*), and being forced to wait for a particularly high tide or spring flood, thereby alerting their enemy to their coming.



A Typical Confederate Ironclad

The average size of these ships was 150 feet by 40 feet with from 4 to 6 guns. In virtually every instance, their engines were too small to propel them adequately. Five knots was a good speed for a Confederate ironclad. The armor was usually 4 inches thick, insufficient to protect them from a 15-inch smoothbore, or even a 10-inch with a heavy charge of powder. Armor not only was inadequate but in short supply. Many—in fact most—of the ships laid down were never completed for lack of iron plating. In view of this, apparently the Confederates would have been wiser to build smaller ships with only two guns, pivot rifles if possible, of shallower draft, and with heavier, though less, armor. One such vessel was built, the *Albermarle,* which was perhaps the most successful ironclad of all (after the *Virginia*).

Matthew Fontaine Maury, "the Great Cartographer," resigned from the Federal service and was commissioned in the Confederate Navy. Almost alone he rejected the concept of the ironclad and advocated construction of a fleet of unarmored steam launches, each carrying one large calibre rifle. His idea gained some acceptance, particularly in civilian circles, until the fabulous performance of the *Virginia* converted everyone to ironclads, and to dreams of raids on Washington and New York. Later on, out of desperation, his idea was adopted in a modified form with the development and use of the *Davids,* tiny steam launches mounting a "torpedo" on the end of a spar. They were to run into the enemy and explode the "torpedo," and survive if they could. "Torpedoes," whether on spars or used as mines, accounted for many more Union warships, including the toughest kind, such as the monitor *Tecumseh,* than all the Confederate ironclads together, and, in addition, made the Union Navy more cautious than it would have been otherwise.

As the war progressed, the design of the ironclads was somewhat improved. The principal innovation, no doubt inspired by the monitor turret, was the use of pivot guns fore and aft, which also could fire out of side ports, enabling four guns to do the work of six. Twin screws also were used widely, enabling the ships to steer better (in principle, at least).

Strategically, the Confederate Navy was in much the same position in which the German Navy found itself in the Second World War. Not surprisingly, its reactions were very much the same, allowing for the lower level of technology, of course. To carry the parallel further, its over-all position in the war effort, both in relation to the Army and to the central government, was quite similar.

The geography of the Confederacy, combined with the complete supremacy of the Union Fleet on the open sea, tended to break up the Confederate naval establishment into a number of self-contained areas. The only "vessels" which could move from one area to another were men and ideas.

These areas were the James River, the North Carolina Sounds, Charleston, Savannah, Mobile, New Orleans, and the Yazoo River, including the stretch of the Mississippi around Vicksburg. (There was another area along the Texas coast around Galveston, isolated pockets in Florida, along the Potomac and Rappahannock rivers, and along the Red and White rivers, but since no ironclads were built or operated in these areas [*] they do not figure in this account.)

It is worth noting that in every one of these areas the United States Navy had a foothold ashore before the middle of 1862, and in most cases, before the end of 1861. It is also worth noting that only one area, New Orleans, was conquered from the sea. In every other instance the decisive attack was made by the United States Army, although the case of Wilmington, North Carolina, may be argued. (In more than one instance the last action of the Confederate ships in the area was against attacking land forces coming from the interior.)

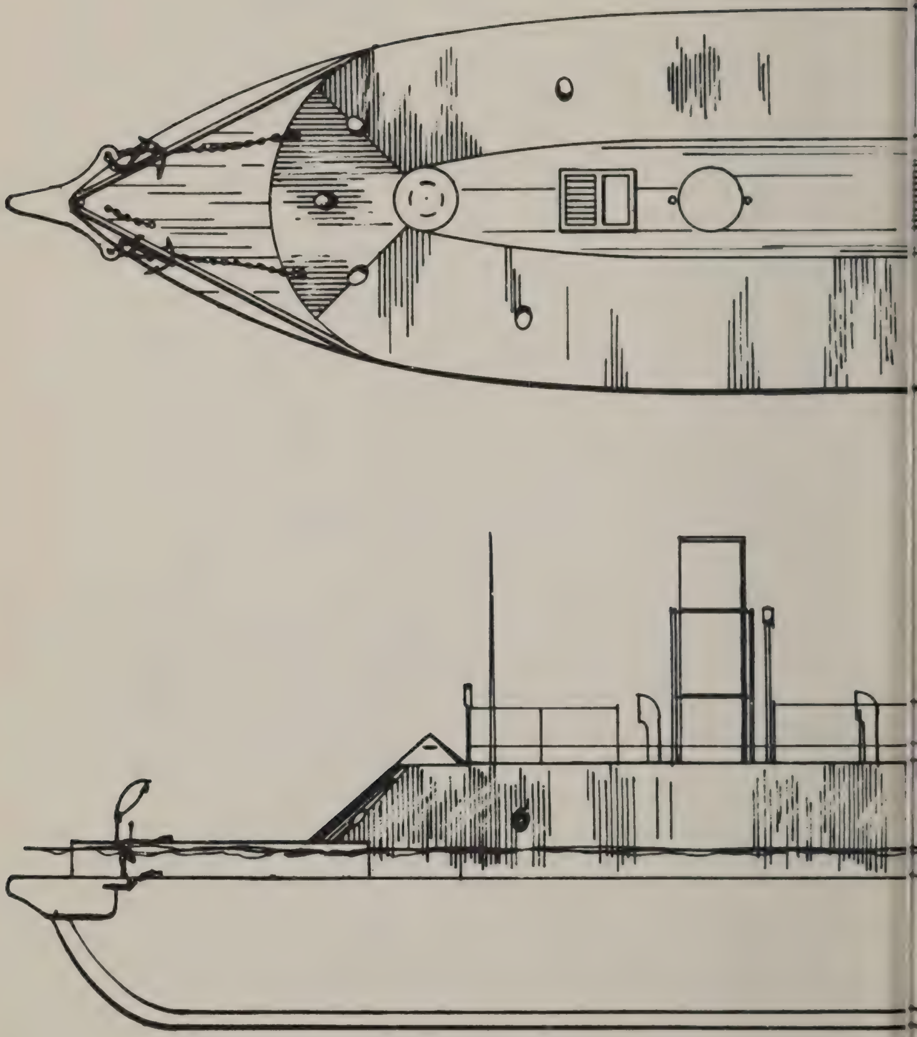
[*] With one exception: the mysterious and ineffectual *Missouri,* built in the Red River area in 1863. Although surrendered to the Union forces at the end of the war, there is virtually no information on her.

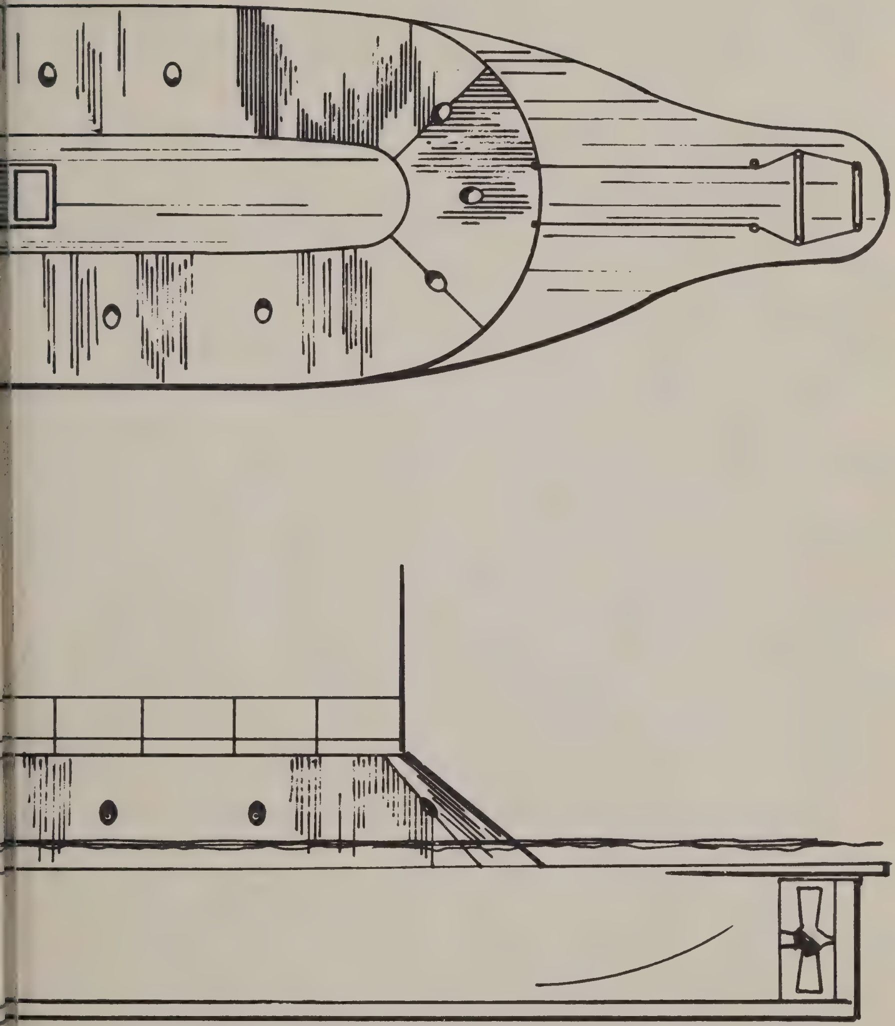
The James River

The already formidable character of the James River area, with its proximity to the industrial facilities of Richmond and its threat to Federal communications on the Potomac River and in the Chesapeake Bay, was very greatly enhanced by the capture of the great Gosport Navy Yard at Norfolk. The acquisition of this base, together with enormous stores of war materials, including some 1,200 cannon, was one of the unexpectedly fortunate turns of the war for the Confederates. It was the result of a relatively rare combination of factors: hesitation, weakness of character on the part of some Union naval officers, preoccupation with more distant areas by others, together with the expenditure of more than usual energy by the Confederates. In fact, it was a very similar stroke of luck which gave the Union forces the port of New Orleans the following year.

Not only was the navy yard and its stores captured intact, but a number of fine ships were scuttled at their berths by the departing Federals. Among these was the great steam frigate *Merrimack,* one of that splendid group laid down in 1855, which, at the time of the *Merrimack*'s destruction, was rated as perhaps the finest class of frigates in the world.

THE *VIRGINIA*





The *Virginia*

The Confederates, after occupying the yard, immediately set to capitalizing on their good fortune. The *Merrimack*, which had been burned to the water line, was raised and placed in dry dock. Two sloops, the *Germantown* and the *Plymouth*, also were raised and were restored to service, but, since they were equipped only with sail power, they were of little use.

Although the *Merrimack*'s upperworks were destroyed, her engines and hull were found to be in workable condition even after a month under water. Her engines never became really reliable, however.

The decision to convert the ruined frigate into an ironclad was made in June by the board of officers already referred to in the previous chapter. While construction was begun on the hull and the casemate, Lieutenant Brooke conducted experiments at the Naval Ordnance Proving Ground at Jamestown Island in the James River, and determined that a minimum of 4 inches of armor was required. Since 2-inch bar iron was the only type available, it was laid on in two layers, and bolted through the 2-foot-thick oak sides of the casemate. Completion of the ship was halted through the winter because of a delay in the fabrication of the iron plate in Richmond. This same shortage of armor plate was to be repeated over and over again during the course of the war.

The defects of the *Virginia*'s design were discussed in the previous chapter; they proved to be common to all Confederate ironclads. Further shortcomings were the rather poor protection given the rudder and the propeller and the lack of any protection below the water line. These defects were overcome in later designs. Of all her drawbacks, the most serious, from an operational point of view, were her excessive draft of 22 feet, and the relative weakness of her engines.

It was this deep draft which prevented the ironclad, now known as the CSS *Virginia*, from driving home its crushing attack on the Union ships at Hampton Roads, on March 8, 1862.

After ramming the sloop-of-war *Cumberland* and wrecking the big sailing frigate *Congress* by gunfire, the *Virginia* was thwarted by the ebbing tide and her deep draft from completing the destruction of the more important prey, the steam frigates *Minnesota* and *Roanoke* (her sister ships). These two were aground and helpless, literally waiting for death, but the *Virginia* could not get close to them without grounding herself.

Returning to her base at Norfolk for the night, the mighty *Virginia* returned the next morning with the tide, hoping to complete the ruin of the Union Navy. The situation, of course, was now completely changed by the dramatic appearance of our old friend the *Monitor,* which had weathered the trip from New York successfully, in spite of several close shaves with the heavy seas off Cape May.

Captain Marston, of the *Roanoke,* the senior Union Captain at Hampton Roads, had ordered the *Monitor* to take station alongside the grounded and helpless *Minnesota,* and defend her from the Confederate ironclad.

As the *Virginia* approached, the *Monitor* got under way and headed for the enemy's starboard bow. The superior maneuverability of the *Monitor* was immediately apparent; she closed to a few feet and passed slowly along the *Virginia*'s starboard side, exchanging mutually ineffectual salvoes with the Confederate ship. Then the *Monitor* turned and attempted to ram the *Virginia*'s exposed stern. Missing it by a few feet, she swung around and passed along the *Virginia*'s port side, again exchanging shots.

The *Virginia* had lost her smoke stack in the action against the wooden ships the day before, and not being equipped with blowers (as was the *Monitor*), she had great difficulty in keeping up steam. The deep draft of her hull again restricted her movements, while the lighter draft *Monitor* continued to steam freely over the shoals.

The *Virginia* attempted to ram the *Monitor* at one point, but the raft successfully absorbed the shock, just as Ericsson had intended.

All things considered, the superiority in design of the *Monitor* over the *Virginia* is unquestionable. Although Confederate accounts of the battle are emphatic on the point of who quit first, etc., they concede that the *Virginia*'s casemate was severely battered by the *Monitor*'s shots, and it seems safer to say that, had the *Monitor*'s gunnery been better, the *Virginia* most probably would have been driven aground or sunk. In this matter of gunnery the advantage was clearly with the *Virginia.* Although the *Monitor*'s turret was a small target, it was hit again and again, and the tiny pilot house on the *Monitor*'s forward deck was also twice hit squarely, disabling her captain and effectively putting the ship out of action for some minutes. Lieutenant Dana Greene, the *Monitor*'s Executive Officer, who was in command after Lieutenant Warden had been wounded, was quite worried about the damage to the pilot house, since another shot would have certainly wrecked it and disabled the steering gear, and making it almost impossible to conn the ship.

The *Monitor*'s fire, on the other hand, was not nearly so effective. In part this was due to the fact that peacetime regulations still in effect limited the powder charge for the *Monitor*'s 11-inch guns to 15 pounds. This was found to be insufficient against most armor. (Later on, it was raised to 30 pounds.) In addition to this, the erratic operation of the *Monitor*'s turret (already referred to in the account of her design) decreased the chances of concentrating her fire at any one point in the *Virginia*'s armor.

After more than two hours of slugging, the contestants called it a day. The *Monitor* had withdrawn to a shoal area to replenish her ammunition supply, and the *Virginia,* leaking badly, but still operational, steamed back to Norfolk. Northern accounts stress the fact that the *Monitor* "remained in possession of the field," and Southern accounts insist that the *Monitor* stopped firing first and retired to shoal water, where her adversary could not follow. After a hundred years the claims as to who "won" must be evaluated in the light of less romantic criteria.

Tactically, honors must go to the *Monitor,* which was fighting a defensive action to protect the helpless wooden ships. The ships were saved, the enemy driven off. The Union Navy, with the responsibility of maintaining the blockade and covering McClellan's operations ashore on the Peninsula, simply could not risk losing the *Monitor* by attempting pursuit of the *Virginia.* Indeed, when, on April 11, the *Virginia* once more reappeared in the Roads, the Union squadron, including the *Monitor,* prudently declined action even after one of the *Virginia*'s attendant gunboats brazenly captured three Union merchant ships almost within range of the squadron's guns. The Northern press was loud in its denunciation of this disgraceful action, but Lincoln and Welles, neither of whom was inclined to excuse faint-hearted behavior, had ordered this course of action, and they stood by it. Time was on the Union side; the *Virginia,* in any case, was doomed the moment that her base at Norfolk was taken. It was sufficient to fend off her sorties, and for this the continued existence of the *Monitor* was absolutely essential. Public criticism of this position, during the weeks following the engagement, was bitter and intense. The Secretary of War, the irascible Edwin M. Stanton, showed his contempt for the Navy's position by engaging millionaire Cornelius Vanderbilt, the New York shipping tycoon, to save the country from the folly of Welles. Vanderbilt responded by fitting out one of his ships with cotton-bale armor and then took her to Hampton Roads where she was equipped with guns and a ram and placed under the complete charge of the Army. Once on the scene, however, Vanderbilt saw the logic of the Navy's position and returned to New York, satisfied that his presence was not required. The steamboat was left behind, but was never used.

In sum, the Union Navy's position was analogous to that of the British Home Fleet in the First World War. Earl Jellicoe's alleged statement after the Battle of Jutland, when, in answer to criticism of his failure to pursue and destroy the German Fleet, he remarked that he was "the only man on either side who could have lost the war in an afternoon," would have appealed to Welles, although the Union position was not quite that desperate.

From a strategic point of view, however, the battle takes on a different aspect. The Army of the Potomac was heavily committed in operations on the Peninsula. The presence of the *Virginia* at Norfolk effectively denied the use of the James River to the Northern forces. General McClellan's reports are explicit about this, as well as the fact that a large part of the naval force was pinned down at Hampton Roads and unable to participate in support operations in the York River. Although, in the light of McClellan's subsequent performance in the campaign, it is questionable whether this naval support would have been decisive, it must be conceded that the failure of the Union Navy to destroy the *Virginia* was a contributing factor to the Union defeat in the Peninsula Campaign.

The final, and the most decisive, point to be considered is the long-range reaction of the two navies to the events at Hampton Roads. In this matter, honors must go to the the United States Navy. Beginning with improvements in the design of the next class of monitors, the Northern commanders reacted well in every respect. Their intelligence of Confederate shipbuilding was brought to a high degree, their tactical and strategic use of Union ironclads was of the highest order, at least as far as nullifying the effect of the Confederate ironclads was concerned. If Hampton Roads was a defeat for them, it was a useful, profitable defeat. For the Confederates it was a barren victory. Not because they ultimately lost the war, but because they failed to learn. They began to build their ironclads with more protection along the water line, but that appears to be the only improvement that came out of the battle.

In addition to being forever handicapped by a belief in the incompetence of all Yankees, they failed to take heed of the limitations which the deep draft of the *Virginia* imposed upon her performance. It was this same deep draft which led to the burning of the *Virginia* by the Confederates on the 11th of May, when the imminent fall of Norfolk deprived Confederate Flag Officer Tattnall of his base. He hoped to take his ship up the James River, but for that he needed no more than an 18-foot draft; even after stripping his ship, it was impossible to take her upriver.

The next encounter between a monitor and a Confederate ironclad was to be a different story, at least as far as the monitor was concerned.

THE *RICHMOND, VIRGINIA II* AND *FREDERICKSBURG*

With the loss of the *Virginia* and of Gosport Navy Yard, the James River Command dwindled in importance. Except for a brief and hopeless flurry of activity in the fall of 1864, the area remained quiet.

Three more ironclads were completed, all on the same Brooke–Porter plan.

The first of these was the *Richmond.* On March 17, 1862, a Colonel Blanton Duncan appealed for contributions to a fund for building a second ironclad. A "Ladies Defense Association" was formed as a result of this appeal, and not only money but scrap iron was collected from all over southeastern Virginia for the project. The Navy Department approved the idea, and appointed an officer to superintend the project. The *Richmond* was completed and in commission by July, 1862, record time for an ironclad. Once completed, nothing much was done with her until the appearance of Grant's forces before Petersburg, in the fall of 1864, turned the James River once again into an active theater of operations.

By this time two more ironclads of the same class as the *Richmond* had been built: the *Virginia II* and the *Fredericksburg.* These three together constituted the most powerful naval force the Confederate Navy ever assembled and sent into action. Each one was 160 feet long, of 16-foot draft, carried 4 to 6 inches of armor and 4 Brooke rifles. However, they had only 20 miles of the James River above City Point in which to operate. Union General Butler's forces had completely blocked the river at Trent's Reach, above City Point, by sinking hulks and planting mine fields. This was done to the intense disgust of the United States Navy which had a force of monitors in the river—the *Tecumseh,* the *Canonicus,* the *Saugus,* and the *Onondaga,* plus the USS *Atlanta,* captured off Savannah the previous year from the Confederates.

On June 21, 1864, the *Virginia* and the *Fredericksburg* exchanged salvos with the *Saugus* across the barrier, and throughout the summer and fall the squadron made occasional forays, mostly against Union troop concentrations along the river. About all that this accomplished was to keep four of the most powerful ironclads in the Federal Navy from being used at Charleston and/or Mobile.

By the third week in January, 1865, all the monitors, except the hulking *Onondaga,* had been sent to other commands. On January 22, a flood had raised the level of the James to a point where it was believed that the *Richmond,* the *Fredericksburg,* and the *Virginia II* could pass the obstructions and get to the Union transports at City Point. An officer was sent to Richmond to inform Mallory. He at once notified General Lee of the opportunity, whereupon Lee asked for a sortie that very night.

The *Fredericksburg,* with a few feet less draft than her consorts, passed the obstructions safely; the others grounded in the swift current. At dawn on the 23rd, the monitor *Onondaga* was sighted on the river below them, heading downstream! At length she reversed engines and came back firing. For this her captain was court-martialed and sentenced to be dismissed from the service, although he maintained that he had only retreated to give himself room in which to maneuver.*

The helpless ironclads remained under the fire of the monitor until about 9 P.M., when a rising tide finally enabled them to get off and proceed downstream, battered but still battleworthy. At this point the pilot of the flagship lost his nerve and said that he could not see well enough to pilot the squadron any farther. He had some justification, for not only had he been fired upon by parties of Federal infantry onshore, and been forced into the armored pilothouse, but the Federals had a calcium searchlight focused on the ships. Upon the pilot's refusal to go any farther, the squadron returned to its moorings above Drewry's Bluff. Soon afterward two more monitors were added to the Union squadron.

This was the last attempt at offensive action on the part of the Confederate ironclads of the James. Eventually the crews were formed into an artillery battalion and used in the defense of Petersburg. With the fall of Richmond in April, the ships were burned to prevent capture, and the sailors, together with survivors of the debacles in North and South Carolina, were formed in the Naval Artillery Brigade. Under the leadership of Rear Admiral Raphael Semmes of *Alabama* fame, the brigade was sent by train to Danville where it was disbanded in a few weeks.

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* Secretary Welles set aside the verdict on technical grounds and the captain merely was relieved of command and retired.

North Carolina

As any map so clearly shows, the geography of the North Carolina coast offered tremendous possibilities to whoever could hold the chain of islands bordering the sounds. In Confederate hands they not only made the Union blockade all but impossible, but they guaranteed the security of the largest body of navigable water in the Confederacy. On the inland coast of the sounds lay a group of towns which housed a respectable shipbuilding industry and a population of good seamen. Rail communications with Atlanta and the interior of North Carolina were good, and communications with Richmond and the James River were enhanced by the presence of the Dismal Swamp Canal. Here was one place where ships could be built in security and the crews trained. Then the fleet could be moved north to the James, or could sally forth from any of a number of channels to harass the Union blockading force, as well as the Union supply line south to Charleston and the Gulf.

The Union naval command could appreciate the strategic possibilities of the coast, too. Once in control of the outer chain of islands, Roanoke Island could be taken and control of the sounds secured. The Canal could be blocked, and Norfolk threatened from the rear.

The Federals lost no time in seizing the initiative. In a series of brilliant moves which were little appreciated at the time, Union forces cracked the island barrier and gained control of the sounds. This was accomplished by the capture of Forts Hatteras and Clark in August, 1861, followed by the capture of Roanoke Island in February of 1862. Traffic by water between the cities bordering the sound thus was made all but impossible. The following month saw the occupation of New Berne, and before long, of Elizabeth City and Plymouth.

These moves constituted a disaster of major proportions for the Confederate Navy. The Confederate response to the ominous developments in the sounds was slow and somewhat hesitant. On April 16, 1862, a contract for the construction of one ironclad gunboat was awarded to Gilbert Elliott, agent for J. C. Martin of Elizabeth City. While stipulating delivery within four months from the date of contract, the contract provided that "if work is interrupted by the enemy, the party of the first part (Elliott) is to receive compensation for work done on the boat to the time of such interruption."

Further reports on this ironclad are lacking, and presumably the work was interrupted by the enemy.

Elliott and Martin received a second contract for the construction of an ironclad gunboat on September 17, 1862. This ship (never named) was built at Tarboro, North Carolina, on the Tar River, and was to be delivered before March 1, 1863. Construction progressed slowly; Flag Officer W. F. Lynch, C.S.N., Commanding Naval Forces in North Carolina, in a letter dated April 6, 1863, to Senator Davis of North Carolina, reported that only her framing had been completed. All work on this ship ceased on August 17, 1863, when a Union cavalry force came up from New Berne and added her to the already long list of Confederate ironclads "burned on the stocks."

Another contract was awarded to the firm of Howard and Ellis of New Berne, for an ironclad gunboat to be completed on or before March 1, 1863, at White Hall, on the Neuse River above New Berne. This ship, the *Neuse,* lived long enough to be completed and commissioned, late in 1864, only to be burned by the Confederates when Hardee's forces withdrew before the advancing armies of Sherman in the spring of 1865.

THE *NORTH CAROLINA* AND THE *RALEIGH*

Farther south, at Wilmington, two more ironclads, the *North Carolina* and the *Raleigh*, were laid down in the spring of 1862, at the yard of Berry and Brother. Here conditions were more favorable to success. Wilmington was guarded by powerful Fort Fisher, and, having excellent communications with the interior, could stand off any Union amphibious thrust. Work progressed steadily on the two ironclads, to the intense interest of Rear Admiral S. P. Lee, U.S.N., Commanding the Union North Atlantic Blockading Squadron.

Much of the population of the coastal regions of North Carolina was lukewarm in its loyalty to the Confederacy, and Lee received frequent and accurate reports of the construction of the two ironclads from deserters and contrabands, including carpenters who had worked on the ships. From these reports, it appears that the *North Carolina* and the *Raleigh* followed Naval Constructor Porter's basic design: length about 150 feet, beam about 23 feet, draft about 12 feet, with a squarish deep-water hull protected by a knuckle of armor-plated timber below the water line and topped by a heavy sloping casemate. The armament was to consist of four guns: two Brooke rifles fore and aft, pivot guns if possible, to fire on center line, or out of ports abeam. Amidships were two smoothbores, one firing to port and one to starboard.

First reports indicated that the two ships would be in commission by the middle of October, 1862, in spite of a series of strikes and walkouts by the workmen. There were delays in shipping the armor from Richmond, and, by April, 1863, Flag Officer Lynch only could hope to have the *Raleigh* ready in eight more weeks, and then only if he could muster a crew. (At that time there were about 60 men on the Navy muster rolls in the entire state of North Carolina.) There were many competent seamen serving in the land forces, but under the provisions of General Order 77 of the Confederate Army, only blue-water sailors could transfer to the Navy. Men who had worked in the sounds as fishermen and pilots were not eligible. The Army, while balking at supplying men and railroad cars to transport the armor from Richmond, proceeded to borrow the *Raleigh*'s two 6.4-inch Brooke rifles for emplacement in one of the forts guarding Wilmington.

Throughout the summer and fall of 1863, construction on the ironclads progressed in fits and starts. By October the *North Carolina* was completed and in commission, but she was so poorly built and shaky that Lynch doubted her ability to put to sea, and further doubted the loyalty and reliability of her conscript crew. The *Raleigh* was still not completed at this time. Fears of a yellow-fever epidemic had caused many workers to leave the area, and Confederate Army control of the railroads still delayed the shipment of armor. Records are vague as to exactly when the *Raleigh* finally was finished. Her destruction, however, took place on April 7, 1864.

On the evening of the 6th she crossed the bar at New Inlet, between Fort Fisher and Smith's Island, and engaged in an inconclusive night action with the Union ships on station, hitting the USS *Howquah*'s smokestack once. At dawn she was still at it, handling well, exchanging shots at long range, but not doing any particular damage to anyone. At about 7 A.M. she headed back across the bar, grounded, and the weight of her armor broke her back. Her guns and most of her armor were salvaged by the Confederates, and several days later she was burned to the water line.

A court of inquiry decided that "the loss of the *Raleigh* cannot be attributed to negligence or inattention on the part of anyone on board." Perhaps they felt that Flag Officer Lynch had endured enough in the past two years.

On July 2, 1864, the redoubtable Lieutenant Cushing, U.S.N., made a night reconnaissance of the Cape Fear River and reported the *North Carolina* peacefully at anchor near Smithville, still too rickety to be trusted. Early in September, in justification of Lynch's fears, or possibly through some negligence or sabotage, she sprung a leak and sank at her mooring, without ever having harmed a soul.

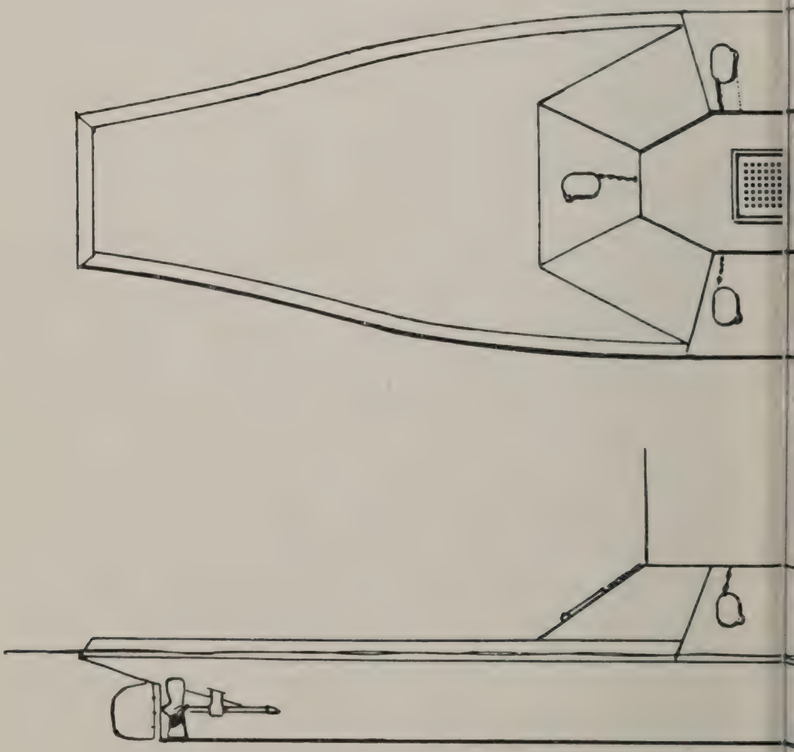
THE *ALBEMARLE*

The only ironclad to be completed and used to any purpose in North Carolina was the *Albemarle*. It is an ironic commentary on the dismal performance of the Confederate Navy in this area that as the result of one victory over a Union gunboat and a converted ferryboat, the commanding officer received the thanks of the Confederate Congress and a permanent place in naval history.

The story of the *Albemarle* begins in much the same fashion as her woebegone consorts. Early in 1863, another contract was awarded to Gilbert Elliott, who had built the unnamed ironclad at Tarboro, for construction of one ironclad gunboat at Halifax, on the Roanoke River. Soon afterward, the Confederate Navy Department ordered Commander James W. Cooke to assist Elliott and to expedite the job. Cooke proved to be a wise choice. Tireless and enthusiastic, he showed what could have been accomplished elsewhere. He ranged through the countryside, begging and buying any kind of iron. He made frequent trips to the Tredegar Works in Richmond, and to the Clarendon Iron Foundry in Wilmington, in search of scrap.

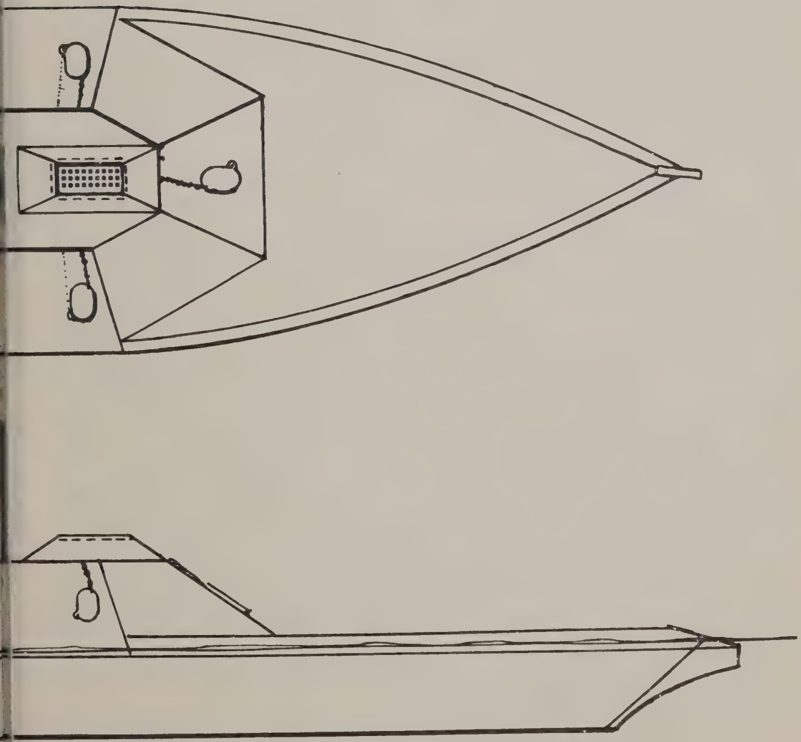
He decided to build the *Albemarle* at Edward's Ferry, about 10 miles downriver from Halifax, where he had leased the farm of one Peter Smith. Although the farm contained no machine shops or shipbuilding facilities, there were abundant stands of yellow pine, needing only to be cut. Carpenters and blacksmiths were recruited and soon were working in the open field. Flag Officer Lynch reported that the *Albemarle*'s keel was laid in April, 1863, and by November she had been launched (without her plating, engines, or boilers). After launching, she was moved upriver to be completed at Halifax, where there were good railroad connections to Richmond. As was always the case, at this point progress slowed to a crawl. There was intense competition in Richmond for the services of the Tredegar Works among elements of the Army and the Navy, and Cooke was forced to bring some of his plating all the way from Atlanta. The ship's engines, as usual, were salvaged—no one knows where—and were in poor repair. Guns were in short supply by that time, and Cooke had to be content with only two 100-pound rifles, one a Brooke, the other an English Whitworth. Both were pivoted to fire out of one of three ports. The general plan of the *Albemarle* was that of the standard model, octagonal casemate, topped by a low pilothouse and a stack. With an over-all length of 122 feet, a beam of 45 feet, two 200-horsepower engines driving twin screws, and 6 inches of railroad iron, she would have been a poor match for even the original *Monitor*. Nevertheless, for the sounds she was a dreadnought. There were no Union ironclads in the sounds, only some of the double-ender gunboats of the *Sassacus* class—useful, but vulnerable with side paddle wheels and thin iron hulls—and a collection of converted ferryboats and yachts, relics of the desperate days of 1861 and the paper blockade.

As the *Albemarle* inched toward completion in the spring of 1864, the Confederate command in Richmond decided to retake Plymouth, at the mouth of the Roanoke River. The capture of Plymouth would give them an opening on Albemarle Sound, and with the *Albemarle* in the sound there would be a chance to do something about Roanoke Island.



For once the Army was ready to co-operate. When, in April, 1864, Cooke was asked by Confederate General Hoke how long it would take him to complete the *Albemarle,* he replied that with 10 more mechanics he could be ready in 15 days. The mechanics were sent, and the officers, men, ammunition, and supplies as well. By the 17th of April, the ship was as ready as she would ever be. With workmen still aboard, she weighed anchor and started downriver to Plymouth.

As always, the Yankees had good intelligence and had been awaiting the coming of the *Albemarle.* Lieutenant Commander C. W. Flusser, commanding the Union naval forces at Plymouth, had followed the progress of the *Albemarle*'s construction almost from its beginning. From contrabands and deserters, he had obtained a fair idea of her plan



The *Albemarle*

and layout, and enough information to make an accurate sketch of a cross section of the ship, which he sent on to his superiors. When Confederate land forces began assaults on the Union strong points above Plymouth, he expected the *Albemarle* to make an appearance, and planned the best reception he could. His force consisted of the USS *Southfield,* a converted ferryboat, and the USS *Miami,* a small double-ender. Each of these ships carried a 100-pound rifle and five 9-inch smoothbores. Flusser also had two small tugs, the *Whitehead* and the *Ceres,* which served him as picket boats and were of little combat value.

On the morning of the 18th of April, the *Albemarle* was at Hamilton, on the Roanoke River, some 12 miles above Plymouth. General Hoke's forces already were attacking Plymouth. Between three and five A.M., they had mounted an unsuccessful assault on Fort Gary, and during the day they made a number of attacks on the Union lines. The *Miami* and the *Southfield* were engaged in supporting the defenders in Plymouth. The *Southfield* upriver of the town shelled the Confederate artillery positions, while the *Miami* kept up a cross fire on the Confederate troops who were attacking Fort Williams, below Plymouth. The *Whitehead* and the *Ceres* were upriver of the *Southfield,* watching for the *Albemarle.*

In the meantime, the *Albemarle* was having troubles. The current in the river was so swift that it caused steering difficulties, and Cooke was obliged to bring her down *stern* first with her anchors dragging! When she had arrived at a point about 3 miles above Plymouth, she anchored at a line of obstructions and torpedoes which blocked the river. Incredible as it may seem, Cooke had no plans for doing anything about passing the obstructions, and after sending a party to reconnoiter, decided that it was impossible to pass them. Whereupon he ordered the *Albemarle*'s fires banked, and the crew and officers not on duty turned in for the night. Cooke no doubt intended to solve the problem in the morning.

At this point Gilbert Elliott, the builder, who was aboard as a volunteer aide and technical adviser, begged Cooke to let him investigate the obstructions and see if something could be done. Cooke let him take a boat and several volunteers to sound the obstructions. Elliott returned with the news that there were 10 feet of water over and above the obstructions, enough for the ship to pass safely. Cooke immediately ordered steam up, and shortly after 1 A.M. the *Albemarle* passed the obstructions and headed for Plymouth.

After a busy day of bombarding the attacking Confederates, the *Miami* and the *Southfield* had anchored below the town, where the Union line was in danger of being outflanked by Hoke's forces. Shortly after midnight, the *Whitehead* sighted the *Albemarle* coming downriver, and reported the fact to Flusser. According to a prearranged and, it would seem, somewhat foolhardy plan, a heavy chain was passed from the *Southfield* to the *Miami*. Flusser's intention was that the two ships would maneuver to catch the *Albemarle* between them, and as the Confederate ship thrust against the chain, the two gunboats would be drawn close alongside the *Albemarle*, where the impact of their guns would loosen her plating, and demoralize her crew from the concussion alone.

At 3:45 A.M., the *Ceres* came downriver, and, passing the *Miami*, hailed Flusser with the report that the *Albemarle* was close behind. Flusser immediately ordered both vessels to move upstream to meet her.

Aboard the *Albemarle*, Cooke had sighted the two Union ships and noticed the chain between them. He surmised their intention at once (although it is possible that he already had some knowledge of the scheme, since the two ships had been chained together part of the day before in view of Hoke's forces). He reacted correctly to the situation by running in close to the south bank of the river, and, when alongside the Union ships, he swung his ship out into the stream, glanced off the bow of the *Miami*, which was closer, and smashed into the side of the *Southfield*. The *Southfield* began to sink immediately. As the *Albemarle*'s bow chains became entangled in the wreckage of the sinking ship, *her* bow was dragged under and she began to ship water through her forward gunport. The *Albemarle*'s crew was starting to panic when the *Southfield* rolled over and released her.

Flusser's *Miami* was right alongside while this was going on and had opened fire on the Confederate. The *Miami*'s guns were still loaded with shells for use against the Confederate infantry, and, as they exploded against the side of the *Albemarle*'s casemate, the shell fragments raked the *Miami*. The third shot was fired by Flusser himself. The shell had a 10-second fuse. It bounced off the *Albemarle*, back to the *Miami*, exploded, and killed Flusser instantly.

The chain had parted and the *Miami* swung toward the shore, while the *Albemarle* turned to ram her in turn. Flusser's second in command decided to quit while he was ahead and turned the gunboat downriver. He soon retreated out of range into the sound.

Thus ended what was probably the most unqualified Confederate naval victory of the war. Plymouth fell to the forces of General Hoke the next day, and the whole of Albemarle Sound was in jeopardy. The *Albemarle* then was ordered to remain at Plymouth and to await the completion of the *Neuse,* still abuilding at Kinston, on the Neuse River.

The Union naval forces were rapidly re-enforced and concentrated in Albemarle Sound. Captain Melancton Smith, U.S.N., his flag flying aboard the double-ender gunboat *Mattabesett,* was placed in command of the squadron. There were no ironclads among the Union ships. The utter failure of the *Casco* class of light-draft monitors had deprived the Northern forces of suitable monitors for the sounds.

Melancton Smith moved his ships, which by that time included the double-enders, *Mattabesett, Wyalusing,* and *Sassacus,* as well as the survivors of the previous battle, to the mouth of the Roanoke River below Plymouth. This was on the second of May.

On the afternoon of May 5, the *Albemarle* was sighted under way coming downriver from Plymouth, accompanied by a transport and a gunboat, the CSS *Bombshell.*

The *Albemarle* attempted to ram the lead ship, the *Mattabesett,* after hitting her twice with the forward Brooke rifle, but the faster Union ship avoided the ram and circled completely around the *Albemarle*'s stern, followed by the next ship, the *Sassacus.* Both ships gave the Confederate a broadside as they passed at close range, and, as they swung around her stern, they shifted their fire to the second Confederate gunboat, the unarmored *Bombshell* which promptly surrendered. Soon they had circled almost completely around the *Albemarle,* with the third ship, the *Wyalusing,* bringing up the rear. As they headed across the *Albemarle*'s bow, they came into the line of fire of the rest of the Union squadron, led by the *Miami,* which had been proceeding in a column to the left of them.

At this point the three ships reversed engines to get out of the line of fire, and the *Sassacus* turned sharply and rammed the *Albemarle,* which at that moment was only about 200 yards away.

The *Albemarle,* unharmed, fired a shell through the bow of the *Sassacus,* followed it with another which ripped open the double-ender's boiler, filling her with steam and scalding the engine room personnel.

After several moments of complete confusion, the *Sassacus* dropped out of action.

The remaining ships continued to circle and pound the slow-moving *Albemarle* with their guns, without doing much damage. Although the *Albemarle* returned the fire occasionally, she did no serious damage to any of her opponents, unarmored though they were. At about 7:30 P.M., it grew dark and the ram returned to Plymouth, the Union forces content to let her go.

Nevertheless, she posed a constant threat to Union forces, especially in view of the fact that there were no Union ironclads capable of crossing the Hatteras bar and entering the Sounds. The *Casco* class of monitors designed by Stimers had been intended for use in this area, but the aforementioned failure of the *Chimo* at its launching in Boston had deprived the Union of any possibility of countering the *Albemarle* with monitors for some time to come.

Admiral S. P. Lee now turned to another quarter for a means of destroying the Confederate ironclad. He had under his command a remarkable young officer—one of the really authentic heroes of the war, Lieutenant William B. Cushing, U.S.N.

After having been dismissed from the Naval Academy just prior to the outbreak of war, for a rather harmless bit of fun at the expense of one of his professors, Cushing had secured an appointment (through the efforts of General Benjamin Butler) as an acting Master's Mate. In October, 1861, he was fully restored to duty as an acting midshipman. After a tour on the *Minnesota,* Cushing appeared in the North Carolina theater as Executive Officer of the gunboat *Perry.* During the next two years, he acquired a fabulous and completely genuine reputation as the leader of many "commando" raids on Confederate ships and shore installations.

In response to inquiries from Admiral Lee, Cushing submitted two plans for the capture or destruction of the *Albemarle.* The first proposed a boarding expedition of about 100 men who would make their way through the swamps bordering the Sound to a point a few hundred yards from the *Albemarle.* The boarding would then be accomplished by using inflatable rubber boats which would be carried by the expedition.

The second plan, which Cushing himself favored and which was adopted, was to equip a steam launch with a spar torpedo, take it up the Roanoke River, and ram the *Albemarle* at her moorings. In New York, Cushing purchased two steam-powered picket launches about 30 feet long, and had them fitted out with an ingenious arrangement whereby the torpedo could be lowered into the water, detached from the boom, and then set off by a line after the launch had backed off a safe distance.

Having completed his preparations, Cushing took the boats to Albemarle Sound via the inland canals to Chesapeake Bay and from there via Chesapeake and Albemarle Canal. One boat was lost in the Chesapeake, but Cushing finally reached the Union flotilla in Albemarle Sound, now under the command of Commander Macomb aboard the gunboat *Shamrock*. On the night of October 27th, soon after his arrival, Cushing took his launch, accompanied by a cutter and a combined force of 20 volunteers, up the Roanoke River. His first intention was to board and capture the Confederate ironclad. When his force had successfully passed the Confederate sentinels stationed on the wreck of the *Southfield*, the boarding attempt looked promising, but soon afterward, as he was attempting to land at a wharf in Plymouth, he was discovered by Confederate sentinels. Cushing then ordered the cutter to return down stream and boldly headed for the ram with his torpedo launch, under fire from the Confederates on both banks of the river. As he approached the *Albemarle*, he saw that she was protected by a barrier of floating log booms. Unimpressed by this barrier, he backed down a hundred yards (under constant fire) and headed full tilt at the booms, intending to vault them with his boat. As he had hoped, the launch cleared the logs, and still under a hurricane of fire from shore he brought her alongside the *Albemarle* and set off his torpedo. In the confusion that followed, Cushing managed to swim to safety, although the rest of the crew was either killed or captured. Dawn found him in the swamps below Plymouth. He managed to avoid the Confederate pickets and learned from an old Negro of the *Albemarle*'s complete destruction. His mission completed, he began a harrowing expedition back through the swamps, and eventually managed to commandeer a skiff and make his way back to the Union flotilla.

With the loss of the *Albemarle*, control of the Sound passed once more into Union hands. Plymouth was retaken and Confederate hopes in North Carolina were extinguished.

Charleston and Savannah

After Richmond, the most promising area in the Confederate States for the construction of an ironclad force was most certainly Charleston, South Carolina, together with the neighboring port of Savannah, Georgia. The well-fortified harbor at Charleston made a secure base of operations, and the combination of a fair-sized local shipbuilding industry and good rail communication with the iron-producing facilities of Richmond and Atlanta offered considerable promise. (An ironclad floating battery actually had been built at Charleston and was in service at the time of the bombardment of Fort Sumter. Shortly afterward, another floating battery had been built with private capital by J. R. Hamilton, who later held a commission in the Confederate States Navy, but these were not in any sense war *ships.*)

The Confederate Navy Department in the summer and fall of 1861 primarily was interested in developing naval forces in New Orleans, and with the capture of Norfolk, in the James River area. Thus it was not until December that any construction at Charleston and Savannah was authorized, or any contracts awarded. By that time the Federal Navy had occupied the splendid harbor at Port Royal, South Carolina, midway between the two ports. With this in their possession, the Federals were, in a very short time, to face the Confederates with the most powerful naval force that had ever existed.

THE *PALMETTO STATE* AND THE *CHICORA*

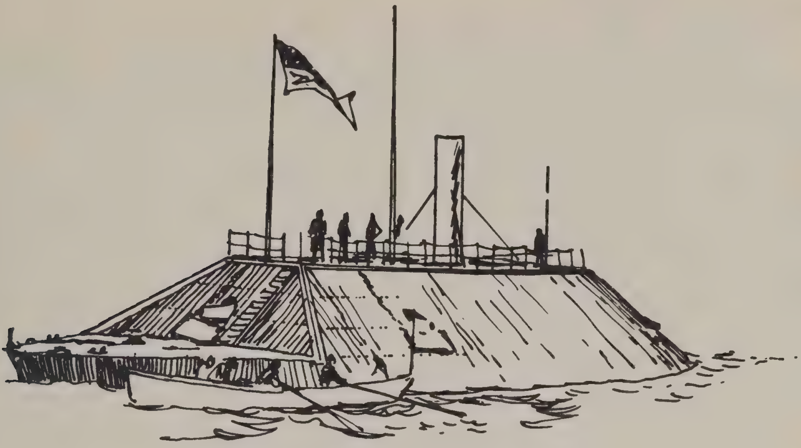
The Confederate response to this challenge began with the laying of the keel of the *Palmetto State* in January, 1862, followed by that of the *Chicora* two months later. Both ships were of the now standard Brooke-Porter design, 150 feet long with a 12-foot draft, which gave them the run of Charleston Harbor at least. The *Chicora* was built under authority of the South Carolina General Assembly and presented to the Confederate States Navy upon completion.

Both ships were finished without any great difficulty and were in commission by November of 1862.

By January, 1863, in response to repeated pleas from Rear Admiral Du Pont, the great ironclad frigate *New Ironsides* and four *Passaic* class monitors had been ordered to the South Atlantic Blockading Squadron. In the short time allotted them before the Union preponderance of power became a reality, the two Confederate ships had a brief moment of glory: on the morning of January 31, the *Palmetto State,* flying the flag of Flag Officer Duncan Ingraham, followed by the *Chicora,* steamed out of the harbor and, taking advantage of an early-morning fog, caught the Union blockading force completely by surprise. The armed steamer *Mercedita* was hit at point-blank range and immediately rammed by the *Palmetto State*. The *Mercedita*'s captain, unable to depress his guns to fire upon the ironclad and with his engines disabled, hauled down his flag. Within a few moments both ironclads had a second converted steamer, the *Keystone State,* under fire, with the same result. The rest of the Union ships scattered and the ironclads returned to Charleston, and a tremendous ovation.

Since this was the only time in the entire war that a Confederate ironclad actually had put to sea, engaged the enemy successfully, and returned safely to port, it seems hardly fair to criticize them. Nevertheless, it must be said that reports after the action indicate that, while the vessels handled well, they were far too slow even to keep the enemy within rifle range. Furthermore, the Chief Engineer of the *Chicora* advised against ramming the *Keystone State* because he did not believe his engines had enough power to back away!

This was their first and last sortie. The two ships remained in the harbor, performing various support activities for Army units under attack on Morris Island, but the strength of the Union ironclads outside the harbor was simply too much for them.



The *Palmetto State*

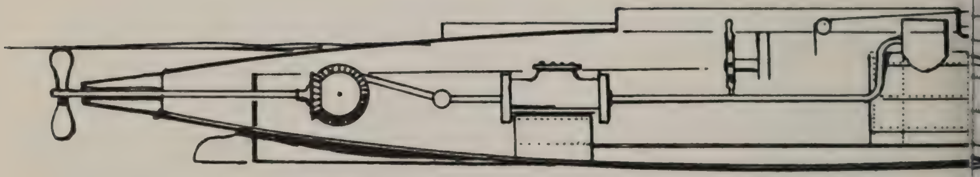
A third ship, the *Charleston,* was laid down in December of 1862, and completed the following September. She was slightly larger than the *Palmetto State* and the *Chicora,* and more heavily armed, but her presence hardly affected the odds.

A fourth ironclad, the *Columbia,* was laid down early in 1863 and never completed.

THE *DAVID* CLASS

Completely outweighed, the Confederates proceeded to develop what have since become the classic weapons of weak naval powers: the mine field and the torpedo boat.

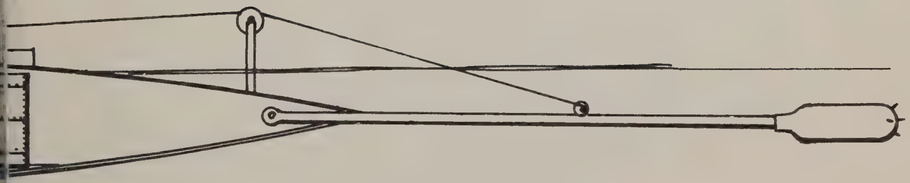
The mines (referred to as "torpedoes" during the war) were of many types, from wooden barrels filled with gunpowder to quite sophisticated moored mines which could be detonated by electricity. They were used sporadically in 1861 along the James River and in the Mississippi, and later on quite systematically in all theaters. The Confederate Army led the way with the establishment of the Torpedo Bureau in October of 1862, and the Navy soon followed with the establishment of the Naval Submarine Battery Service under Matthew F. Maury. For the Confederates, the torpedo was an ideal weapon. Small and easily manufactured by relatively unskilled labor, they could be readily transported and used to render the coastal waters extremely dangerous to the most powerful Union warships. By the end of the war, torpedoes had accounted for many more Union vessels of all types than all other weap-



ons combined. Moreover, the fear of torpedoes exercised a powerful restraint on Union commanders. Du Pont's failure to press on with the attack on the Charleston Forts in April of 1863 was due in no small measure to the fear of losing his precious monitors to torpedoes.

The effectiveness of these weapons inspired a citizen of Charleston, Theodore Stoney, to build the first torpedo boat, the *David,* at his own expense and present it to the Navy. With a volunteer crew from the ironclads, this unlikely ship attacked the most powerful Union ship of all, the *New Ironsides,* on October 5, 1863, under cover of haze and darkness. Although the *New Ironsides* survived the attack, she was many months undergoing repairs, for the explosion of the 60-pound charge had strained her plates and had caused many leaks. The *David* and most of her crew actually survived the attack.

The success of the *David* inspired a torpedo boat program of considerable proportions. By the end of the war, some 22 had been built, and although only one major combatant ship actually was sunk by a *David,* there is no question but that their presence did a great deal to enhance the Confederate position.

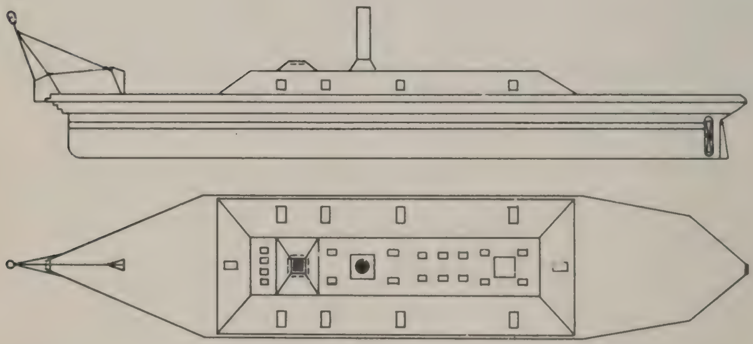


The *David* Class

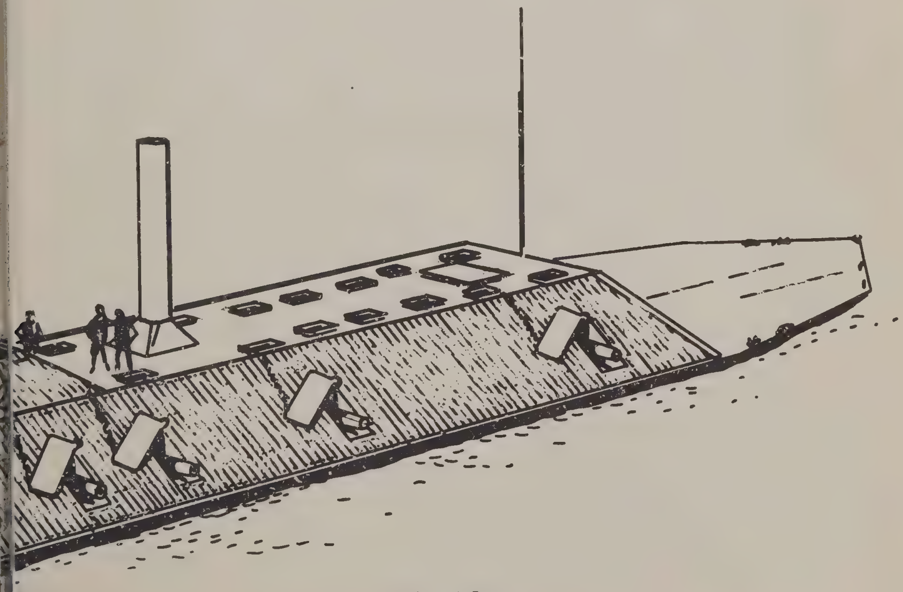
THE *ATLANTA*

The story of Savannah follows very much the same pattern as that of Charleston. With the concentration of Union ships based at Port Royal, South Carolina, any Confederate effort to attain naval supremacy was bound to be futile. Nevertheless, the Confederate Navy Department considered the effort absolutely necessary.

For once luck was on the Confederate side at the beginning. In September, 1861, Captain Bullock, the Confederate naval agent in England, purchased the steamship *Fingal,* brand-new, designed as a blockade runner with a speed of 13 knots. The *Fingal* ran the blockade in



November and arrived at Savannah with a large cargo of war materials. Then, as the blockade tightened, it was obvious that she was not going to get out. Her draft prevented her from using any of the devious channels that provided a back door to the harbor. After several attempts, Captain Bullock, who had come in on the *Fingal,* informed Mallory that it was impossible, and suggested that she might well be converted to a warship. In January, the Confederate Navy purchased the ship and converted her into the ironclad ram *Atlanta* in much the same manner as the *Virginia* had been converted. She was cut down to the water line, and an armored deck projecting 6 feet beyond the hull proper was installed, topped by the usual casemate. John A. Tift, the designer of the *Louisiana* and the *Mississippi,* supervised her conversion, and his concept of straight lines and planes for easy construction is very much evident in her deck plan. When completed, the *Atlanta* measured 204 feet in length. She was armored with 4 inches of English railroad iron (part of the *Fingal's* original cargo), and armed with two 7.4-inch Brooke rifles amidships, and two 9-inch Brooke rifles mounted on pivots fore and aft. Her bow was equipped with a ram and a spar torpedo.



The *Atlanta*

THE *GEORGIA* AND THE *SAVANNAH*

Another ironclad, the *Georgia,* also was under construction at Savannah in the spring of 1862. A monster 250 feet long, with a beam of 60 feet, and armed with 7 guns, the *Georgia* turned out to be worthless as a warship because of that perennial trouble—bad engines. She could barely move under her own power, so she was used as a floating battery in the Wilmington River, and had to be towed from one place to another.

Since the *Georgia* was a failure, construction was begun on another ironclad, the *Savannah,* of the same class as the *Atlanta.* Work on the *Savannah* progressed smoothly enough, with no more than the usual delays throughout the fall and winter, while Tattnall awaited her completion before moving against the Yankees. It is odd that no attempt was made to use the guns and armor of the useless floating battery in the construction of the *Savannah,* and also that no plans were made to make a joint attack in conjunction with the ironclads at Charleston.

. . . .

Both the *Georgia* and the *Atlanta* were in commission by June, 1862, when there were still no ironclads in the Union blockading squadron. Under the command of Lieutenant Charles McBair, the *Atlanta* made its first tentative sortie. Now in command at Savannah was Josiah Tattnall, C.S.N., the old salt who had replaced Franklin Buchanan as flag officer in the James River Squadron, and had taken the fainthearted pilot's advice and burned the *Virginia* rather than attempt to take her up the James River. Flying Tattnall's flag, the *Atlanta* appeared at the mouth of the Savannah River on July 31, 1862, and gave the Federals in Fort Pulaski a bad scare. However she was found to steer very badly because of the tremendous weight of her armor, and so returned to her moorings without attempting any offensive action. In January of the following year, an effort to take the *Atlanta* out was thwarted by the discovery of obstructions in the ship channel. At the next spring tide on February 4, Tattnall headed downriver again. At this time the monitors had arrived and were sharpening their teeth on Fort McAllister, guarding Ossabaw Sound, south of the Savannah River. Tattnall returned again to Savannah, being afraid to leave the wretched *Georgia* unattended. For this indecision he was removed from command.

In the spring of 1863, the situation at Savannah began to deteriorate. The *Atlanta* broke her main steam valve, lost way, and got stuck on a mudbank. Although she was floated off the next day, a new valve had to be made at the ordnance works in Columbus, Georgia, and this took several weeks. The *Savannah* now was ready for sea trials; on her first trip on June 30, she appeared to steer well, but her guns and crew were still to be found.

The matter of crews was becoming serious. When the *Georgia*'s crew was asked to re-enlist on July 1, not one of them would do so until he received all of his back pay and a guarantee of pay once a month in the future. A week later, a writ of habeas corpus, on behalf of one crew member, was served on the commanding officer of the *Georgia.* Flag Officer Hunter, Tattnall's replacement, after consulting with Richmond, told the *Georgia*'s skipper to obey the writ, and the Confederate Navy Department asked the local district attorney to represent them in the case. The court ruled against the Navy and the man was released, opening the way for the release of all whose enlistments had expired.

The South Atlantic Blockading Squadron was very much interested in the CSS *Atlanta.* Deserters and contrabands brought frequent news of her construction and armament, and of Confederate plans for putting her to use. Early in June, 1863, Major Charles Halpine, Chief of Staff of the Union X Army Corps, sent word to Rear Admiral Du Pont that deserters from the Savannah area reported that the *Atlanta* soon would emerge from its berth on the Wilmington River to attack the Union fleet.

This news was not unexpected. On June 10, Du Pont ordered Captain John Rodgers, commanding the monitor *Weehawken,* to take up station in Wassaw Sound, at the mouth of the Wilmington River, together with the monitor *Nahant,* commanded by Commander John Downes. The two unarmored steamers on station in Wassaw Sound were relieved at the same time.

Actually the *Atlanta* was far from ready for any extended action.* Confederate plans called for the *Savannah* to accompany the *At-*

* Judging from letters between Secretary of the Navy Stephen Mallory and Lieutenant William Webb, the captain of the *Atlanta,* their plans were to move up to the Charleston area and attack the main Union force *outside* the Charleston bar. Here the monitors would be less effective, for the *Atlanta* was a seagoing vessel. (She had no difficulty making Port Royal later on.)

lanta, but at this time the former was still far from complete. Moreover, the *Atlanta's* crew still needed training. Only about 20 of her crew of 140 ever had been to sea; the rest were conscripts from the Georgia hill country, inexperienced in seamanship as well as in handling the big guns.

However, when Lieutenant William Webb, Commander, Naval Forces Afloat, at Savannah, learned of the appearance of the two monitors in the sound, he immediately decided to make a limited sortie to attack them. He planned to explode the spar torpedo carried on the *Atlanta's* bow against one monitor and then engage the other. After their destruction, he would return to his base below Fort Thunderbolt, on the Wilmington River.

In their efforts to minimize the inconclusive action at Hampton Roads, the Confederates obviously had come to underestimate the power of the improved monitors, with their 15-inch guns. The armor of the *Atlanta* apparently never had been tested, nor had consideration been given to the effect, or rather lack of effect, 6- and 7-inch rifles would have on the 11-inch armor the two monitors carried. If these matters had been given some thought, it would have appeared foolhardy, if not suicidal, to attempt an attack in the calm waters of the sound, where the lighter-draft monitors could outmaneuver the ironclad.

On the night of June 16, Webb confidently weighed anchor and brought the ship down the river to a point 5 or 6 miles from the monitors' mooring. He was accompanied by two unarmored gunboats. These ships were to engage any unarmored steamers which might be found in Wassaw Sound. (The captain of the *Nahant* reported that they were full of sight-seers, including ladies come to watch the fight. Confederate reports are silent on this.)

The *Atlanta* anchored and waited until 3:30 A.M., when the tide was at quarter flood and the sun was coming up behind the monitors. At that time she weighed anchor and started down the river.

Forty minutes later, lookouts on the monitor *Weehawken* sighted the *Atlanta* near the mouth of the river, about a mile and a half away. The *Weehawken* beat to quarters and slipped her cable at 4:20. The *Nahant* weighed anchor a few moments later. Both ships stood out to sea, toward the northeast point of Wassaw Island, drawing the *Atlanta* out into the channel. At 4:20, the *Weehawken* turned and headed for the Confederate ironclad, the *Nahant* following about a half-mile behind her.

While they were about this, the *Atlanta* grounded on a bar off the southeast corner of Cabbage Island, to the north of the river. Webb ordered engines backed while the monitors turned and bore down on him. The ironclad was now broadside to the channel. After backing frantically for 15 minutes while the monitor closed, the *Atlanta,* helped by the incoming tide, backed off the bar. Now Webb ordered hard right rudder and engines ahead, in order to turn his ship into the sound. The tide, still increasing, pushed against his starboard bow, nullifying the effect of the rudder and causing him to run even farther on the bar.

The *Weehawken* was now only three quarters of a mile away, with a confident, cold-blooded captain, a competent, professional crew, and a big 15-inch gun.

Hoping to gain a few minutes, Webb fired one shot at the *Weehawken.* The shot passed over her and splashed near the *Nahant.* Rodgers declined to be provoked into a duel at long range and came on. It was now 4:55 A.M.

When the *Weehawken* had closed to 300 yards, she opened fire on the *Atlanta,* which was still lying crosswise in the channel, her bow fast on the bar, her stern in deep water. It was now 5:15 A.M.

In rapid succession, the *Atlanta* was hit on the sloping casemate just below the pilothouse, on the edge of the deck, on the pilothouse itself, and on one of the gunport covers. The armor was shattered on the casemate, and, although the shot did not penetrate the compartment, it smashed and tore the brittle pine backing along the whole side, hurling great splinters, as well as the solid shot in the racks, through the compartment. Almost 40 men were wounded and disabled.

The cast-iron framework of the pilothouse was shattered and the armor plating pierced, seriously wounding both pilots and stunning the helmsman. The starboard gunport was shattered, and fragments were driven into the compartment.

Now both the *Weehawken* and the *Nahant* were on the *Atlanta*'s quarters, in the zone where no guns could be brought to bear on them. Realizing that he was helpless, Webb hauled down his flag, to the chagrin of the commander of the *Nahant,* which so far had had no opportunity to fire a shot. It was now 5:30 A.M.

A prize crew from the monitors was put aboard, while the *Atlanta*'s two consorts wisely streaked back upstream. By 8:30 A.M., the tide had come in and the *Atlanta* was off the bar, on her way to Port

Royal. After a refit she was taken into Federal service, and eventually served in the Union James River Flotilla.

Webb went into captivity until the fall of 1864. He appears briefly in Confederate records as commanding officer of the ironclad *Richmond* in the James River, where perhaps he had occasion to see his old ship.

Ironically, while the *Atlanta* went on to a useful career in the U.S. Navy, the victorious monitor *Weehawken* did not have long to live. On December 6, 1863, she foundered while moored inside the Charleston bar, and drowned most of her crew.

The Confederates were at a loss to explain the defeat of the *Atlanta,* their finest ironclad. Lieutenant Kennard, the captain of the *Isondiga,* one of the accompanying steamers, could only surmise that her crew had mutinied. No one seems to have been able to account for the fact that the *Atlanta*'s commanding officer, with 22 years active service in the "old Navy," had managed to run his ship aground in waters with which he should have been thoroughly familiar, at a time when it was vital to take special pains to stay afloat.

Following the loss of the *Atlanta,* the situation at Savannah became hopeless. The *Savannah* was completed, and another ironclad, the *Milledgeville,* was begun at Columbus, Georgia, and never finished. On the 13th of December, 1864, forces of General Sherman captured Fort McAllister and began closing in on Savannah itself. Helpless in the face of an attack from the interior, the squadron, once more under the command of Josiah Tattnall, could do no more than shell the Union forces along the river. The *Milledgeville* and the *Georgia* were blown up on December 20, but the *Savannah,* which could still move, gallantly went upriver to Hutchinson, and harassed the rear of Sherman's columns. She was still fighting on the 21st when, sometime that day, her ammunition ran out and she was blown up to prevent capture.

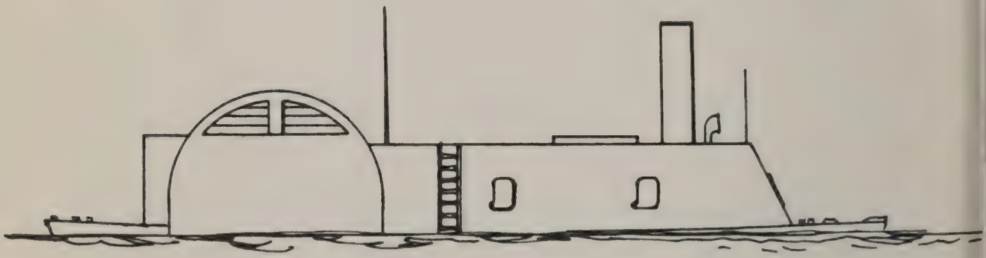
Mobile

Unlike the other centers of naval activity in the Confederacy, there were virtually no shipyards or machine shops in Mobile at the outbreak of the war. Before a serious shipbuilding program could be launched, it was necessary to acquire and construct these facilities.

Nevertheless, Mobile was the second cotton port in the country, with an excellent harbor and good water communications with the interior. There were iron and timber available in northern Alabama, needing only to be processed. The Confederate Navy Department, however, had other preoccupations. Although construction of an ironclad was authorized by an Act of the Alabama Legislature in November, 1861, nothing was really done in the Mobile area until the spring of 1863. By that time, Union control of the Mississippi Valley was almost complete, and the prospect of operations against Mobile began to take on serious proportions.

Rear Admiral Franklin Buchanan, who had briefly commanded the James River Squadron in the spring of 1862, was appointed to the command of the naval forces at Mobile. At Selma, 150 miles up the Alabama River from Mobile, the Navy had enlarged the privately owned iron foundry—begun in 1861 by Colin McRae—into the enormous Naval Gun Foundry and Ordnance Works, under the capable direction of Commander Catesby ap R. Jones, who had commanded the *Virginia* in her great days at Hampton Roads. This plant was capable of casting and finishing rifles up to 7 inches (later to 10 inches) and could produce a fair amount of armor plate.

The unfinished ironclad begun by the state of Alabama was turned over to the Confederate Navy for completion. Records on this ironclad are very sketchy, but it appears that it was the *Baltic,* a side-wheel steamer 186 feet long, and that the armor was quite light, along the lines of a Federal tinclad.



The *Baltic*

THE *TENNESSEE*

By November, 1863, a prodigious construction effort was in progress. At Selma, the largest ironclad ever built in the Confederacy was well under way—the *Tennessee*, 209 feet long, with a beam of 48 feet and a draft of 14 feet. She was framed with 13-inch yellow pine timbers and covered with 5½ inches of yellow pine and then 4 inches of oak. The armor was 5 inches thick on the sides of the casemate, 6 inches on its forward end, with 2 inches of armor on the deck.

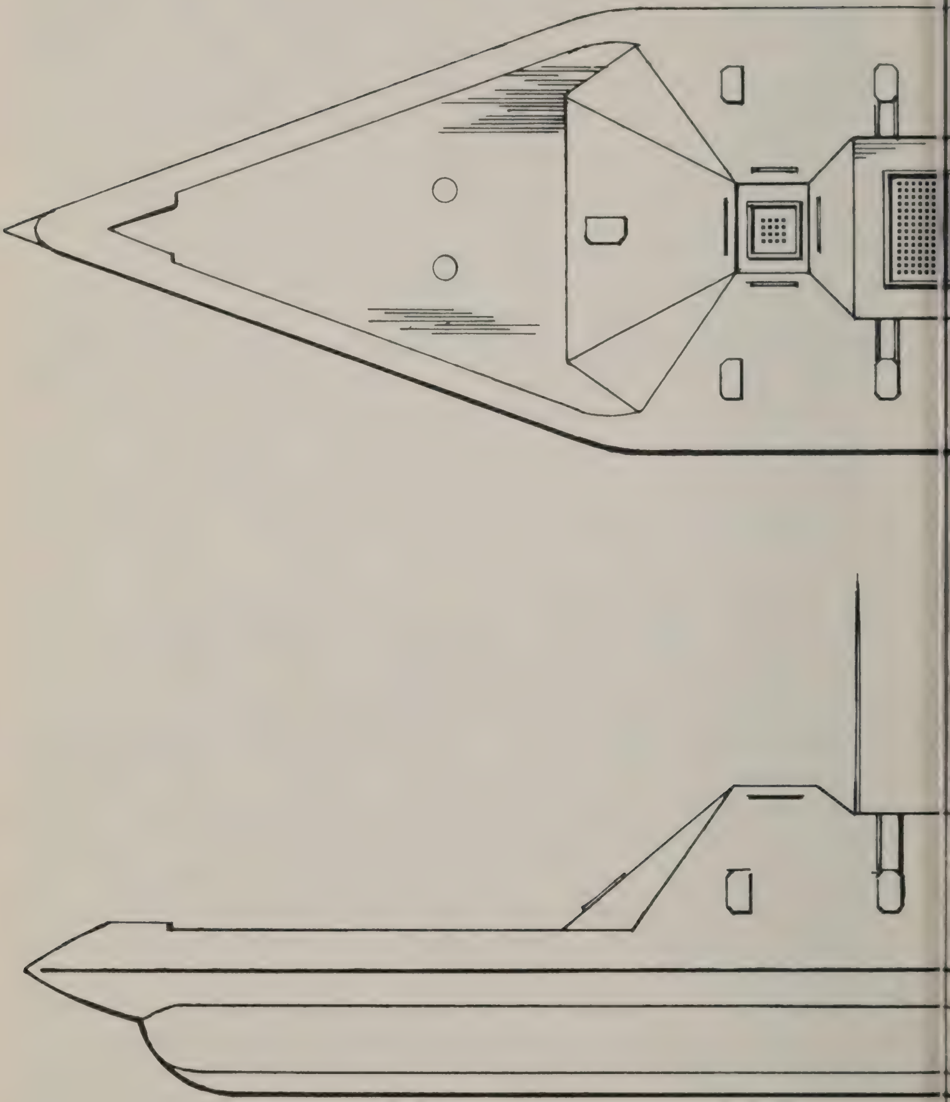
The *Tennessee* was built at the Naval Ordnance Works. (It is worth noting that invariably the Confederate Navy got the best results when it built its own ships rather than relying on private contractors.)

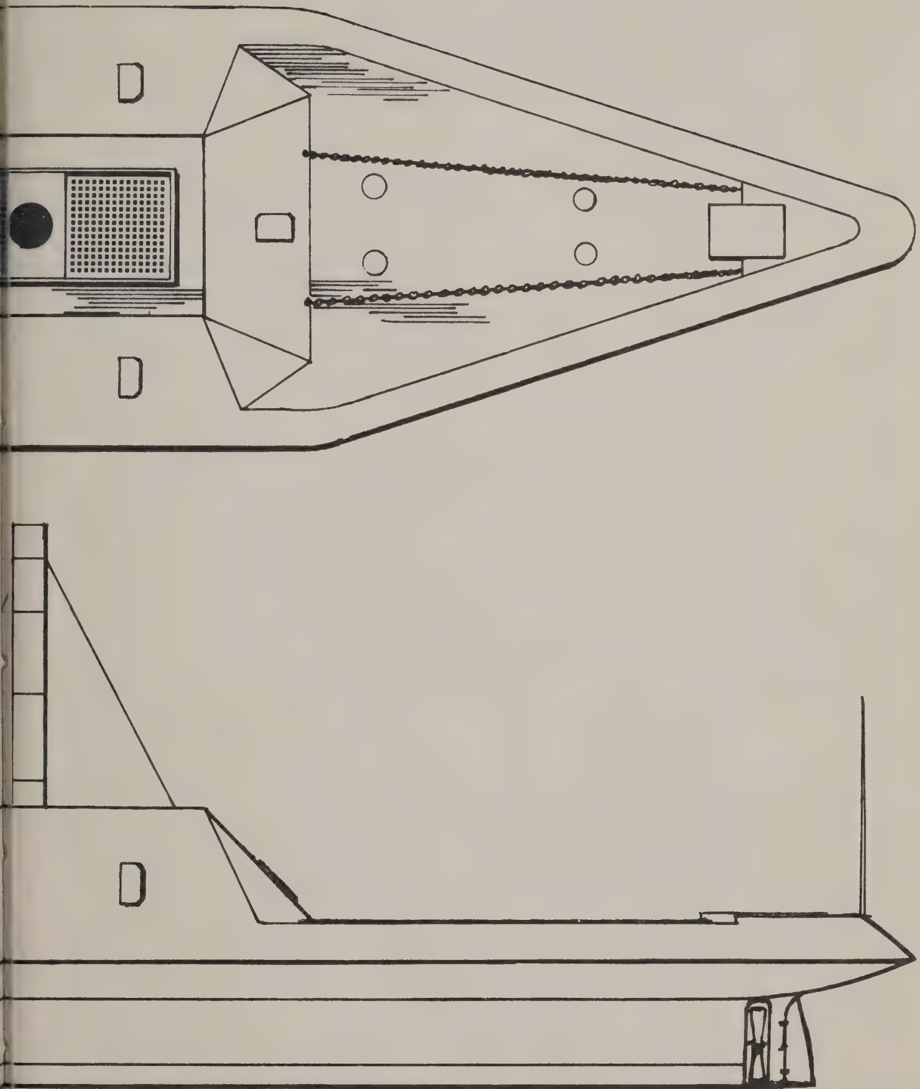
After being launched in the winter of 1863, the *Tennessee* was towed downriver to Mobile for completion. For once the organization was functioning, and her plating had already been shipped from Atlanta. Her guns, however, still remained to be cast at Selma. Throughout January, 1864, Catesby ap R. Jones labored to produce the necessary rifles, in the face of a severe shortage of skilled labor. The armament was to consist of two 7⅛-inch Brooke rifles mounted in pivots at each end, and four 6-inch rifles, two on each broadside, the standard armament. The Selma Works could produce no more than one gun a week, so the 6-inch rifles had to be sent from Atlanta.

On February 16, 1864, the *Tennessee* went into commission, showing what energetic and capable men could do when they had to.

Buchanan now found himself with two serious problems to solve. The first was the complete lack of trained officers and men for the ship. The other was the same problem which, in one way or another, had dogged virtually every Confederate ironclad skipper: the excessive draft of his ship. In order to reach Mobile Bay, Buchanan had to get his ship, drawing 14 feet, over the Dog River Bar, which was at the most 9 feet under water. Unlike some other captains, however, Buchanan took the difference into consideration and solved the problem by building a set of camels * to lift the ship 5 feet higher in the water. The camels took two months to build, but at last, on May 18, the *Tennessee* was successfully floated across into the bay where she was promptly run aground! She was floated off the next morning, however, and proceeded to an anchorage near Fort Morgan, guarding the entrance to the bay, to await

* Barges, filled with sand, then lightened, while lashed to the ship they are lifting.





The *Tennessee*

the impending assault by the Union West Gulf Blockading Squadron.

On August 5, 1864, Rear Admiral David Farragut's force entered Mobile Bay. He had waited many months for ironclad warships and for the Army's support in reducing the powerful forts guarding the approaches to Mobile. He now had four powerful monitors, the *Tecumseh* and the *Manhattan* of the *Canonicus* class, sent from the Atlantic Coast, and the *Winnebago* and the *Chickasaw,* both twin-turreted light-draft vessels of the *Winnebago* class.

The squadron entered Mobile Bay with the tide, the wooden ships lashed together in pairs in the port column, the monitors in the starboard column with the *Tecumseh* leading. The Union force was obliged to pass within 200 yards of Fort Morgan, and losses were expected, not only from the powerful guns of the Confederate fort but also from the mines offshore. Farragut's expectations were not long in being fulfilled. As the lead monitor headed for the Confederate battle line (led by the *Tennessee*), which had formed in line ahead just within the bar, she struck a mine and quickly sank with a great loss of life, including that of her captain, Commander Tunis A. M. Craven.

The Confederate ships, which, in addition to the *Tennessee,* included the unarmored gunboats *Selma, Gaines* and *Morgan,* were drawn up behind a minefield. When the *Tecumseh* sank, the other monitors continued on ahead. The *Brooklyn,* however, leading the port column, began to back engines after her people sighted mines. The *Hartford,* Farragut's flagship, was immediately behind the *Brooklyn,* and after reversing her engines passed the *Brooklyn* and headed for the Confederate ships, soon coming under a severe fire from the Confederate *Gaines.*

The *Tennessee,* which had engaged only in a desultory, long-range fire at the Union ships, now headed for the *Hartford,* with the intention of ramming her amidships. After closing to a distance of about 200 yards, the Confederate ironclad unexpectedly turned and headed for the line of ships behind the *Hartford.* The *Tennessee* then steered for the *Brooklyn,* and again steered off, and so passed along the whole Union line, exchanging fire with each ship in turn. In the course of this maneuver, the *Tennessee* was rammed ineffectually by the Union *Monongahela.*

The Union column, which had not been too seriously damaged by the *Tennessee's* fire, continued into the bay towards the *Hartford,* now about four miles away. The *Tennessee,* after coming under the fire of the remaining Union monitors, ran under the guns of the Confederate Fort Morgan. At this time there was a lull in the fighting. The Union wooden ships attended to their wounded and cooked breakfast. The Confederate gunboat *Gaines* had been badly worked over by the *Hartford* after the Union flagship had bypassed the *Tennessee*. The remaining Confederate gunboats were harried by the Union gunboat *Metacomet*, the *Selma* being finally taken and the *Morgan* escaping to Mobile.

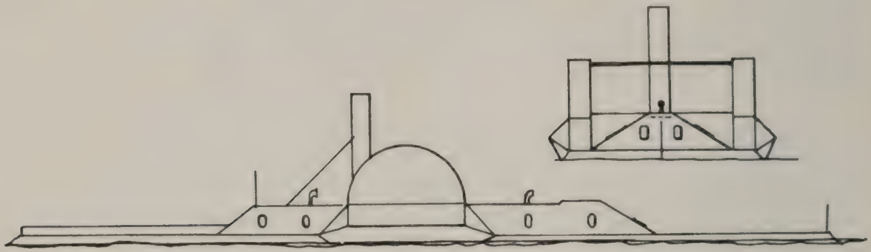
The Union crews had hardly finished their breakfasts when the *Tennessee* was seen approaching. The Union ships then got underway and proceeded to mob the slow-moving Confederate. In succession he was rammed by the *Monongahela* and the *Lackawanna* and brought under heavy fire from the *Hartford*. The ramming had no effect whatsoever on the heavily armored *Tennessee*, and the 9-inch guns of the *Hartford* did no appreciable damage either, but the *Tennessee*'s unvulnerability was somewhat nullified by the failure of her own guns to fire.

By this time, the slow-moving monitors had come up, and were methodically hammering the ironclad with their 15-inch guns at point-blank range. Although only one of the *Manhattan*'s guns was in operation, and the *Winnebago*'s turrets were jammed, the monitors kept at it, particularly the double-turreted *Chickasaw*.

The bow and stern port shutters of the *Tennessee* were soon jammed by this fire, her smokestack was knocked down, and most seriously, her rudder chains were cut. Due to one of those inexplicable negligences of the Confederates, the *Tennessee* had been built with the chains which connected her rudder to the steering wheel running completely exposed across her afterdeck; thus the 2-inch deck armor gave them no protection. With no power of direction, the *Tennessee* drifted down the bay, hounded by the monitors. At this time, Confederate Admiral Buchanan was wounded by a splinter of iron from one of the port shutters and Captain J. D. Johnston took command. Johnston endured another 20 minutes of this fire and then, with the permission of Buchanan, hauled down his flag. Fort Gaines surrendered the next day, and Fort Morgan followed suit on August 22, thus effectively closing the port of Mobile, although the city itself was not captured for many months.

The *Tennessee*, after repairs, was, like the *Atlanta*, taken into Federal service, where she was considered a very effective addition to the West Gulf Blockading Squadron.

THE *NASHVILLE, HUNTSVILLE* AND *TUSCALOOSA*



The *Nashville*

A second ironclad had been laid down, the *Nashville,* unusual in that she was a side-wheel steamer, resembling the *Lafayette* class, rather than the usual Brooke–Porter type. This was apparently the only vessel of this type constructed by the Confederate Navy.

The *Huntsville* and *Tuscaloosa,* two other smaller ironclads of the Brooke–Porter design, were laid down at Mobile in the fall of 1863. Work on the three continued throughout the spring of 1864, showing little of the efficiency that marked the construction of the *Tennessee.* There were the usual shortages of iron plates, skilled labor, and guns. Naval Constructor Porter visited Mobile in March and recommended that the *Baltic*'s plating be removed and used on the *Nashville,* but even this was insufficient. The *Nashville* finally went into commission with only the forward end of the casemate armored with 6 inches of plate, and the aft end with 2 inches. The sides were left unarmored, like the Federal *Cairo* class riverboats.

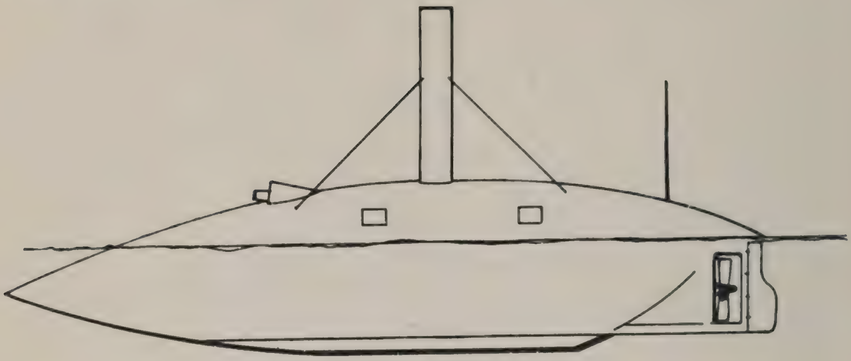
The *Huntsville* and the *Tuscaloosa* did not go into commission until August, after the Battle of Mobile Bay had crushed whatever hopes the Confederates had of breaking the blockade, and it is doubtful if they were completely armored either.

The two ironclads hung on until the fall of Mobile the following April, without ever going into action, when they finally were sunk to avoid capture. The *Nashville* retreated upriver and was surrendered at the end of the war. So much for Mobile.

New Orleans and the Yazoo River

New Orleans occupied the attention of the Confederate authorities from the very beginning of the war. The naval program got off to an early start in March, 1861, when a commission, made up of Commander Laurence Rousseau, Commander E. Farrand, and Lieutenant Robert Chapt, all former officers of the U.S. Navy, was ordered to proceed to New Orleans to buy and/or build 10 light-draft gunboats of 1,000 tons.

THE *MANASSAS*



The *Manassas*

In May the Confederate Congress authorized the issuance of Letters of Marque to privately owned ships. One of the results of this was the design and construction of the very first Confederate ironclad ram, the *Manassas.* This ship was converted from the tug *Enoch Train,* built in Boston in 1855. She was purchased by a syndicate of New Orleans businessmen for conversion to a privateer. Under the direction of J. O. Curtiss, a local ship designer and builder, she was strengthened longitudinally, and given a ram some 20 feet long, built solidly of 17-inch timbers and plated with 1½ inches of iron. The entire deck was arched over with 12-inch timbers and also plated with 1½-inch boiler iron. Rechristened the *Manassas,* she carried only one gun, a 68-pound smoothbore mounted in the bow. This ship also was equipped with hoses to throw scalding water over the sides in case she was boarded.

Her weakest feature was her engines, which drove her at a speed of no more than 4 knots. This made her far too slow for a privateer, and in October, 1861, she was taken into Confederate service as a warship.

To the little *Manassas* goes the distinction of being not only the first ironclad in commission on either side, but the first ironclad to see action. On the night of October 11, 1861, the *Manassas* attacked the Union force on station at the Head of Passes, in the Mississippi River below New Orleans.

The force was made up of the *Vincennes,* a sailing sloop of 18 guns; the *Richmond,* a propeller-driven sloop of 24 guns; the sailing sloop *Preble,* 18 guns; and the side-wheel steamer, *Water Witch,* 3 guns.

The Federals had no picket boats out, and evidently not much of a watch was being kept, for the *Manassas* came in boldly and rammed the *Richmond* amidships.

It happened that the *Richmond* had a barge with coal alongside, and the *Manassas,* instead of striking the side of the *Richmond,* crashed into a solid wall of coal. Although the sloop was damaged slightly, the *Manassas* was badly hurt. The shock of impact knocked her funnel down and shook her engines loose, and she drifted downstream without power and full of smoke. The Union ships fled, most of them by simply cutting their cables and drifting downstream.

Eventually the *Manassas* got her engines to work again and limped home to New Orleans. The next time she went into action was in April, 1862, against Farragut's fleet at New Orleans, where, after ineffectually ramming the *Brooklyn,* she was finished off by two broadsides from the *Mississippi.*

. . . .

The same bad luck that dogged the *Manassas* was to follow every Confederate ironclad, without exception, during the entire war.

Although the record does not especially reflect it, the fact remains that the Confederate ironclads as a whole were rather good ships. The Union Navy captured three of them in the course of the war and was quite happy to make use of them against their former owners. While it is doubtful that any of these ships could have stood up to a *Passaic* class monitor at close range, most of them should have been able to defeat, or, what was almost as effective, to drive away any other type of Union warship. It is true the Confederate ironclads generally were slow, but they were also good sea boats, judging from reports of the *Atlanta* and the *Tennessee* after they were taken into Federal service. When armed with Brooke rifles, they were capable of long-range action, and their rams, of course, spelled doom to any class of ship to which they got close.

However, they could not be effective when the Confederate Government appeared to have no ideas about how to use them, or when the

Confederate Army would not give their builders any priorities on use of the railroads, or iron plating, or trained seamen conscripted into the army. Nor could they be effective when their commanders were either foolhardy or hesitant, or ran them aground, or when their crews couldn't shoot.

The story of these ships is a pathetic one of opportunities missed, ignorance—particularly on the part of the Confederate cabinet and the Army—and, with some notable exceptions, of plain incompetence. The most wonderful thing which runs through the entire story is an almost lunatic optimism and confidence on the part of all the Confederates, from the Secretary of the Navy to the landsmen at the guns. Regularly, and without fail, they expected the Yankees to make every mistake possible in the given situation and to make no mistakes themselves. And more often than not, they expected the Yankees to be fainthearted and cowardly.

Now with all due respect, this assumption might have had some validity in relation to the Union Army, which, after all, was filled with amateurs on all levels, and which had been known to execute some colossal blunders, to say the least. The Union Navy was quite another story. There were no rear admirals and commodores of volunteers, nor aldermen turned captains or commanders, or even lieutenant commanders, in the Union Navy. They were professionals to a man, and, with the exception of the affair at the Head of Passes just mentioned, they were almost never stupid, and never cowards. As far as their being lethargic and fainthearted, in this matter the Union Navy Department was completely ruthless. The merest suspicion of such behavior meant professional ruin for officers of any rank or position.

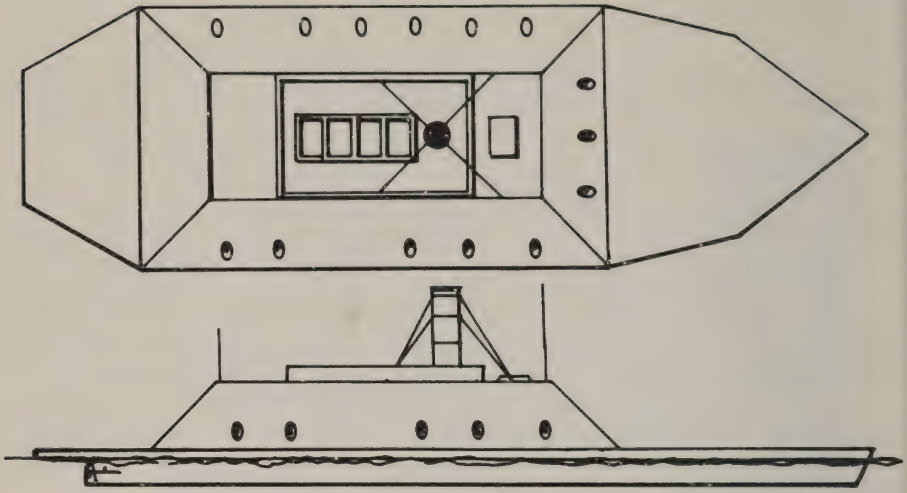
On the other hand, the Union Navy rarely underestimated the Confederates. Although success followed success as far as attacking and destroying Confederate ironclads were concerned, each new one was treated as a dangerous enemy. The progress of their constructions was followed assiduously; their probable employment was anticipated, and usually they were expected to put in an appearance sooner rather than later. They were conceded all possible efficiency, and their commanders always were expected to be courageous and competent.

THE *LOUISIANA*

In addition to the *Manassas,* two other ironclads were built at New Orleans, and both suffered the alternate fate in store for Confederate ironclads: that of being destroyed by their builders to prevent them from falling into Union hands.

In July, 1861, Commander Rousseau had been recalled to Richmond, his place being taken by Commodore George N. Hollins. Like Rousseau, he was a former officer of the U.S. Navy. One of Hollins' first actions was to negotiate a contract with E. C. Murray, a New Orleans shipbuilder, for the construction of one ironclad, to be named *Louisiana.* The design for this ship was prepared in Richmond by Brooke and Porter and was of the pattern that would become the Confederate standard—casemate amidships, submerged decks fore and aft. It also embodied Mallory's conviction that one big ship was worth more than several smaller ones. The *Louisiana* was enormous—6,000 tons, 246 feet long, with 16 rifles of assorted sizes, and covered with 4 inches of armor. She featured a novel propulsion system (which was to be her undoing), consisting of two paddle wheels in tandem, set in a well amidships, and two small propellers astern, which probably were intended more for steering than for propulsion. The paddle wheel amidships was an attractive idea, and it had occurred to Eads for the same reason: it protected the paddle wheels. It was not a satisfactory solution, however, since it caused the ship to ride its own wake, as it were. In order to keep the turbulence and friction within manageable proportions, the paddle wheels could not bite very deeply into the water, and consequently the wheels did not produce very much power. The result of this arrangement was a slow, unwieldy boat. (Ericsson had encountered something of the same difficulty with his propeller well arrangement.) This already unsatisfactory situation was made worse by the peculiar tandem arrangement (one behind the other) of the wheels, so that the after wheel had to struggle with the turbulence created by the forward one. Another drawback was that the wheels were so far forward, almost amidships, in fact; this increased the area of the hull affected by the turbulence.

The first steam-powered warship, Robert Fulton's *Demologos,* way back in 1815, had used a similar arrangement, and had achieved a top speed of less than 4 knots. The builders of the *Louisiana* never tested this propulsion system—that eternal optimism again—and when at last it



The *Louisiana*

was necessary to move the ship (to fight Farragut), she could produce virtually no power and had to be towed.

In spite of Hollins' early start, it was not until October 15 that the keel of the *Louisiana* was laid and construction begun. Although New Orleans was a shipbuilding center of sorts, there were neither iron foundries nor facilities for building engines of any size. The process of building her was one that was to be repeated again and again in the Confederacy. The wooden hull and casemate progressed fairly quickly even if the workmanship was rough, for timber was plentiful and readily available (in this case coming from the shores of Lake Pontchartrain by rail). Engines were obtained only by taking them out of an existing boat, with availability the first consideration, state of repair the second, with power and suitability a poor third. When it came to the plating, the situation was always desperate. At this stage the construction effort sagged to the point of despair. Iron of some sort was available, but ironworks, rolling mills, and forges were not. And above all, there was a chronic shortage of rail transportation to bring the iron to the building site.

In addition to this, there were frequent delays and stoppages due to strikes. Confederate paper was not considered money by the laborers, and, in the case of the *Louisiana*, not by the local government either.

THE *MISSISSIPPI*

The second ship contracted for was the *Mississippi.* This one was almost as long as the *Louisiana* and was to carry 20 guns in her casemate, as well as a second deck above the gun deck pierced for sharpshooters. The armor was to be 3 inches thick. The propulsion system was another novelty, and like that of the *Louisiana,* led to the *Mississippi*'s ruin. It consisted of three engines driving three shafts and three propellers.

The center shaft was to be 9 inches in diameter and 50 feet long, of wrought iron rather than the usual cast iron. Only the Tredegar Works in Richmond could handle such an order. The two outer shafts were to be of the same diameter and 40 feet long.

The *Mississippi* was the creation of Nelson and Asa Tift, brothers and millionaires who offered to build her for nothing. Nelson Tift produced the basic design. He very intelligently arrived at the conclusion that if the *Mississippi* were to be finished at all, dependence on conventional shipbuilding techniques and on highly skilled (and scarce) shipwrights must be avoided. He designed her without the complex curved surfaces of most ships of the period and substituted flat planes and angles throughout, thereby permitting the use of ordinary house-building carpenters and equipment.

Brooke and Porter added their own ideas, and Mallory approved their scheme and gave them a contract. Returning to New Orleans, the Tifts contracted with the same E. C. Murray who was building the *Louisiana.* Work was begun on September 25, 1861. The woodwork was completed in about four months and then the usual troubles with the iron plating began. The great shafts required special equipment, and no ironworks was willing to retool to do the job, because plenty of other war contracts were available. At last, in December, the Patterson Iron Works, in New Orleans, agreed to make the two smaller shafts. Tredegar did not begin the main shaft until the following February, and it was never delivered.

In spite of all the delays and shortcomings, the Confederates at New Orleans were on the way to completing what would be the two most powerful warships in the world. In the North, only the *Monitor,* the *Galena,* and the *New Ironsides* were building, and of the three only the *New Ironsides,* not to be commissioned for over a year, could compare with them.

The Union squadron, wooden ships every one, arrived in April, 1862, and put an end to both ironclads. The *Louisiana,* after being towed downriver on the 20th of April, was moored about a half-mile above Fort St. Philip and was guarding the approaches to the city. With only her bow and starboard guns able to bear, she attempted to engage the Union ships as they passed. Here the usual bad luck prevailed. Her ports were found to be so small that her guns could not be trained or elevated more than 4 or 5 degrees. In spite of this, she managed, with a 9-inch shell, to hit the *Brooklyn* about a foot above the water line. If the shell had exploded, it surely would have sunk the *Brooklyn,* but nothing of the sort happened. The shell later was found embedded in the timbers of the Union ship with the lead patch that covered the fuse intact, so that the shell could not explode. Someone had neglected to remove the patch!

When New Orleans surrendered, the still intact *Louisiana* was blown up by her crew. The *Mississippi,* minus guns, propellers, and armor, was burned by the Confederates the next day to prevent her capture by the Federals.

THE *ARKANSAS* AND THE *TENNESSEE*

As part of the same ambitious program that resulted in the building of the *Louisiana* and the *Mississippi*, the Confederate Congress, in an Act dated August 24, 1861, authorized the construction of two ironclads for defense of the Upper Mississippi.

Delivery was specified for December 24, 1861, and heavy financial penalties were to be imposed on the contractors for each day that completion was delayed beyond that date. Both of these ironclads were built more or less according to the standard plan, with a casemate amidships, low decks fore and aft, and a ram bow.

The two ships were laid down in October at Memphis, Tennessee, under the direction of a local boatbuilder, John T. Shirley. Although the building of the wooden hulls was the easiest part of the job, it was delayed by a lack of labor, particularly carpenters, because of the widespread conscription by the Confederate Army. By December, the seriousness of the labor situation prompted Secretary Mallory to write a desperate letter to General Leonidas Polk, pleading for men:

". . . The completion of the ironclad gunboats at Memphis by Mr. Shirley is regarded as highly important to the defense of the Mississippi," he wrote, and went on to try to educate the general to the importance of naval support: "One of them at Columbus would have enabled you to complete the annihilation of the enemy . . .

"Had I not supposed that every facility for obtaining carpenters from the Army near Memphis would have been extended to the enterprize, I would not have felt authorized to have commenced the construction of them, as it was evident that ruinous delays must ensue, if deprived of mechanics this way."

Ruinous the delays were. When the Eads ironclads attacked Memphis on June 5, 1862, both ships were still incomplete. The *Arkansas* had been launched and was partially plated; the *Tennessee* was still on the stocks, and her precious armor, salvaged from all over the state of Arkansas, was still across the river. The wooden-hulled Confederate River Defense Fleet had no chance against the armored Eads boats, and in the first and last fleet action of the war, the rebels were defeated completely. Memphis was lost; the *Tennessee*, like the ironclads at New Orleans, was burned to prevent capture.

The *Arkansas* fared better. Although in no condition to fight, she could float. As early as April 25, her commander decided to take her up the Yazoo River to safety and completion, for New Orleans was no longer a possible haven.

Three days later, Lieutenant Isaac N. Brown, late of the U.S. Navy, reported for duty as her commander. He found the ironclad at Greenwood, Mississippi, about 100 miles from the Mississippi River. He also found her anchored and ignored in the swamps, surrounded by ships which had fled the great river, and almost 4 miles from dry land.

Lieutenant Brown was precisely the type of man the South needed in order to create a navy. He was tough, energetic, and driving. Nothing discouraged him. There was no steam hammer at Greenwood; he built one; no gun carriages; he designed some and had them built; the barge bringing the iron from Memphis sank and had to be raised; he raised it; meanwhile recruiting and training a crew. He soon had 200 men working 2 shifts and 14 forges. Like virtually every other Confederate ironclad that ever went into action, the *Arkansas* was still incomplete, with many workmen aboard, when, on July 13, 1862, the falling waters of the river made it absolutely imperative that she head for the Mississippi.

A few days earlier she had been inspected by Captain William F. Lynch, newly appointed to the command of Confederate Naval Forces, Western Waters, who pronounced her "inferior to the *Virginia.*" She was inferior in every respect (her engines were especially poor); but she happened to be superior to any Union ship on the river, for in addition to being completely armored, she carried two 8-inch columbiads forward, two 6.4-inch Brooke rifles aft, on the broadside two 6.4-inch rifles, two 32-pounder smoothbores, and two 9-inch Dahlgrens. Although the weight of metal she could throw was not much greater than that of a *Cairo* class gunboat, her four rifles had much greater penetrating power than the *Cairo*'s smoothbores. The ram, of course, was unequaled in the Union squadron. The only rams the Northerners had on the river were those built by the Army's Colonel Ellet, and they were not armored at all.

Undoubtedly, one Confederate ironclad, no matter how powerful, could not have turned the tide. Considering what was at stake, the wonder of it is that the Confederates could not, or did not, build two or three. Despite all the arguments that they did not have the industrial capacity, railroads, etc., the fact remains that Isaac Brown got this one ironclad built. Later on, when they were desperate, they managed to build four of them in the North Carolina marshes, and the following year they had three * under construction at Yazoo City. (They were all burned to prevent capture in May, 1863.) By then it was too late.

Capable though he was, Lieutenant Brown was hounded by the usual Confederate bad luck. On the trip down the Yazoo, it was discovered that the powder in the magazine had been dampened by steam escaping from the wretched engines. It was necessary to tie up along the bank of the river one whole day and spread the powder out to dry in the sun.

By this time the only base available to the Confederates was Vicksburg, and it was Brown's intention to run to Vicksburg and, once having secured coal and ammunition, drive south, with the hope of relieving New Orleans.

The Union forces had received reports of her departure, and on July 15, the ironclad *Carondelet,* a *Cairo* class gunboat, accompanied by the *Tyler,* one of the wooden gunboats built by Captain John Rodgers at Cincinnati, and the *Queen of the West,* one of the Ellet rams, entered the mouth of the Yazoo. They met the *Arkansas* about six miles upstream.

The unarmored *Tyler* was leading, and she immediately turned around and headed downstream. The next in line was the *Carondelet,* and her captain swung *her* around and headed downstream. (This was one case of valor being the better part of discretion, since the *Carondelet* had no armor whatsoever on her stern and only two 32-pounder smoothbores firing aft.) The *Queen of the West* simply fled.

The *Arkansas* fired at the retreating *Carondelet* for an hour without doing much damage. During the exchange, the pilothouse of the *Arkansas* was hit; Brown and one pilot were wounded, and the other pilot was killed. This put the Confederate ship at a disadvantage, since she drew 13 feet, and a pilot was a necessity to avoid the numerous bars in the river. The intention of ramming the *Carondelet,* which was now hugging the shore, was abandoned, and the *Arkansas* passed her, exchanging a broadside and then swinging out into deep water. She continued to chase the *Tyler* right out into the Mississippi. Below the mouth of the Yazoo was the Union squadron: Farragut's ships up from New Orleans, and Flag Officer Davis' collection of Eads gunboats and Ellet rams from upriver. Only one ship had steam up at all. With her funnel shot full of holes, the *Arkansas* now was making a speed of only about one knot, but she proceeded right through the line of Union ships, firing as she went by, and being hit by each ship in turn. The damage on both sides was negligible. In a few minutes, the *Arkansas* had passed out of range, leaving two disgusted Union squadron commanders behind.

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* CSS *Mobile,* CSS *Republic,* and one unnamed monster 310 feet long with 4½-inch armor.

The Union squadron got steam up and headed for Vicksburg, where the *Arkansas* now was moored, arriving just after dark. Lieutenant Brown had anticipated this, and had taken the precaution of moving his ship as soon as it was dark, so that it was impossible to see her against the shore. Only one stray shot hit her, killing five of the crew.

A second attempt to get her was made by the *Essex* on July 22. Although the *Arkansas*' bow was penetrated, causing the deaths of seven men and the wounding of six more, she was able to leave Vicksburg on August 3, with orders to support a Confederate land attack on Baton Rouge, Louisiana.

This was to be her last voyage. Her decrepit engines kept breaking down, and, since she was equipped with twin engines driving twin screws, this tended to make her steer badly. Finally, after both engines had stopped, she was started, and one engine failed to respond. She curved into the bank and stuck fast. While she was in this predicament, her bow in a mudbank and her stern swung downstream by the current, the *Essex* appeared 'round the bend like a stage villain. Isaac Brown might have thought of something, but he had been wounded, and her new commander, Lieutenant Stevens, was a practical man. As soon as the *Essex* opened fire, he abandoned ship and so added her to the growing list of Confederate vessels "burned to prevent capture."

The *Arkansas* was the first and last fighting Confederate ironclad on the Mississippi. Three others were built and subsequently burned at Yazoo City, and a fourth, the *Missouri*, was built on the Red River and completed in time to be surrendered in June, 1865.

Confederate Ironclads Built in Europe

Had Mallory's plans for purchasing ironclads in England and France been successful, it is conceivable that the entire war would have taken an entirely different course. It is well to remember that powerful though the monitors were, they were primarily designed for use against forts, and would have been useless in protecting wooden ships of the blockading squadrons against even reasonably fast ironclad cruisers. While it is safe to assume that the appearance of such ships off the Southern coast would have evoked energetic measures by Union land and sea forces to close the ports from which the cruisers could operate, it is still possible that the blockade might have been broken beyond repair.

The Confederates' efforts to obtain these cruisers in Great Britain and France were in the hands of a very capable and energetic former U.S. Naval Officer, Captain James D. Bullock. With the assistance of Lieutenant James H. North, Bullock maneuvered unceasingly to get ironclads built and turned over to the Confederate Navy.

While much has been made over the fact that the British people were solidly behind the cause of the North, especially after the Emancipation Proclamation, it is reasonable to assume that this support in itself was not the decisive reason that the Confederates could not buy ironclads. The real reason, in the first half of the war at least, is contained in a coded message from Lieutenant North to Mallory dated September 18, 1861:

"Can do anything in the way of shipbuilding if I only had the money. Please let me hear from you.

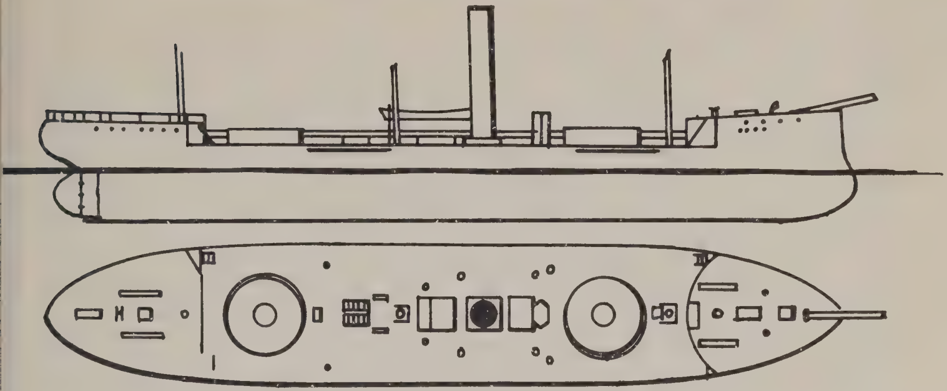
North"

That Mallory could send him no money was largely due to Jefferson Davis' policy of withholding cotton from the European market at the beginning of the war in the hope that it would cause the British and/or French to intervene in order to obtain their precious commodity. Had the cotton been safely sent to warehouses in Europe before the blockade was imposed, the acquisition of ironclads would have been possible, whether the Confederate States were recognized or not.

Bullock did manage to acquire commerce raiders in England, such as the *Alabama* and the *Florida,* as well as blockade-runners, regardless of British public opinion.

By the time the Confederates had the money necessary to purchase ironclads, the portents indicated a Northern victory, and the Lincoln government was not backward in letting the British and French governments know what would happen to them when the war was over. Great Britain could expect a fleet of American commerce raiders to destroy her commerce as the *Alabama* and the *Florida* had ruined that of the United States; and the French Emperor was given to understand that one day he might well see American shipyards building ironclads for Prussia!

In spite of these handicaps, Bullock had a near success. In March, 1862, he contracted for two ironclad turret rams with Laird of Birkenhead, said rams to be 230 feet long with a beam of 42 feet and a 15-foot draft. They were to carry four Armstrong rifles in two turrets. In January, 1863, the British Foreign Secretary, Lord Russell, informed Bullock that unless Her Majesty's government was satisfied that the rams were legally owned by a foreign government (not the Confederate States of America), they would not be permitted to depart. At that time the



The *Scorpion* and *Wyvern*

rams were only half finished, giving Bullock time to think of some subterfuge. He opened negotiations with the French banking firm of Messrs. Bravay, with the plan of having them act as dummy purchasers of the vessels for the Khedive of Egypt. Adams, the American Minister to Great Britain, got wind of this and bluntly informed Lord Russell that if those rams were allowed to sail, it meant war with the United States. Eventually the ships were sold to the Royal Navy as HMS *Scorpion* and HMS *Wyvern.*

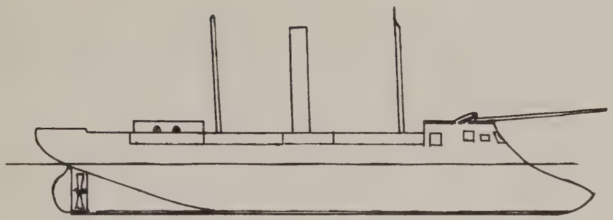
Bullock was somewhat more successtul in France. In June, 1863, he contracted with Arman, one of the largest shipbuilders in France, for the construction of two ironclad rams similar to those being built by Laird. At the same time, he ordered four "corvettes," apparently not armored, from M. Voruz, a wealthy iron founder who was agent for several shipbuilders in Nantes. Authorization for the construction of these ships was obtained from the Minister of Marine and Colonies, Compte de Chasseloup-Loubat. In his request for authorization, M. Arman described his ships as vessels intended for commerce in Pacific waters, and eventually for sale to China and Japan. The Minister not only authorized their construction, but consented to their being armed as warships.

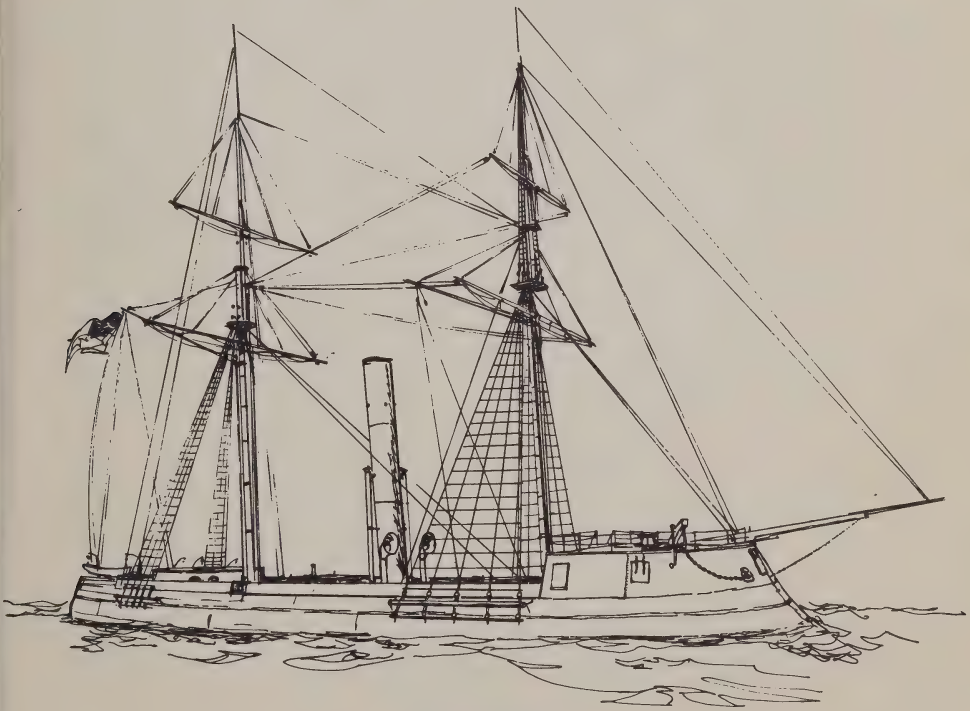
The United States Government, as Bullock complained later, had developed a very efficient secret service in Europe and kept close watch on his activities. Before long the U.S. Minister had come into possession of a set of letters between Bullock and Arman, revealing plans for the ironclads. Retaining one of the foremost lawyers in France, M. Antoine-Pierre Berryer, he prepared to challenge the legality of M. Arman's contract in terms of an Edict of the French Emperor forbidding French citizens from taking sides in the war. The suit could not fail to show the connivance of the French Minister of Marine and Colonies, and most likely that of the Minister of Foreign Affairs as well, so the threat was enough to force the Imperial Government to forbid Arman to release the ships to the Confederates.

Having a considerable investment to protect, Arman sought to sell the ships to dummy buyers for Bullock. He was only partially successful in this effort to assist Bullock, although he did manage to sell the ships elsewhere. Two corvettes were sold to Chile, one corvette and one of the rams to Prussia. The other ram, at this time known as the *Sphinx,* was sold through a Swedish banker to Denmark, then at war with Prussia. Whether or not M. Arman arranged this sale for the Confederates' benefit is not known; most probably he didn't care who bought it by that time. In any case, the terms of the contract with the Danish Government called for delivery on or before June 14, 1864. The date was important because Denmark was still at war with Prussia and needed the ship. Delivery was not made, however, until October of that year. The Danes had made peace by then and so refused delivery. In January, 1865, the *Sphinx,* having left Bordeaux the previous October as the *Stoerkodder,* with a Danish crew, was discovered at Quiberon Bay in Brittany under the name of *Olinde,* with a French captain and crew. Alongside her was a British steamer, the *City of Richmond,* commanded by a lieutenant in the Confederate Navy. The *City of Richmond* was transferring heavy guns, ammunition, and a British crew to the *Olinde.*

The American consul at Nantes immediately notified the American Minister in Paris, who informed the Ministers of Foreign Affairs and Marine and Colonies. These gentlemen told him of the sale to Denmark, and washed their hands of the matter. Inquiries to the Danish Minister in Paris revealed the story of Denmark's refusal to accept delivery of the ironclad.

While this was going on, the *Sphinx-Stoerkodder-Olinde* had acquired still another name: CSS *Stonewall.* Under the command of Captain T. J. Page, she had departed from Quiberon Bay. Once under Confederate colors, the inevitable Confederate bad luck came into play. The ram sprung a leak and was forced to put into Ferrol, Spain, for





The *Stonewall*

repairs. While the American Minister in Madrid was trying to have her detained, she moved on to Lisbon. Two United States ships had been watching her, the *Niagara,* a frigate carrying ten 150-pound Parrott rifles, and the sloop *Sacramento,* carrying two 11-inch and two 9-inch rifles. Both ships were unarmored and slow, so refrained from attacking her. The senior captain, Craven, eventually was court-martialed and acquitted, in view of the manifest superiority of the *Stonewall.*

Late in March, 1865, the *Stonewall* left Lisbon and, after stopping at Nassau on May 6, proceeded to Havana. Here she was surrendered to the Captain General of Cuba for $16,000, the amount of wages due the crew.

In July she was turned over to the United States and eventually sold to Japan, where she received her last name: *Mikasa.*

Appendix I. Ordnance

The Naval Ordnance of the Civil War is a subject in itself, and its details are outside of the scope of this book; a few notes, however, may be offered on the characteristics of some of the more widely used types of guns.

THE DAHLGREN GUNS

The principal characteristic of the Dahlgren type (developed by Rear Admiral John Dahlgren prior to the war) was their bottle-like shape, the result of detailed studies of the explosion cycle in a smooth-bore gun. The results of these studies indicated that the pressure of the expanding gases dropped off considerably towards the muzzle, as the shot was propelled forward. This indicated the need for a much heavier wall around the breech, and a lighter one towards the muzzle. This form permitted the use of much heavier charges than had ever been possible with the more or less cylindrical form developed over the past three centuries. Such a charge was necessary to propel the new explosive shells, relatively lighter than solid shot of the same diameter, at velocities sufficient to penetrate wooden walls. When used against ironclads, solid shot were used with the same powerful charge.

One of the drawbacks of the larger Dahlgrens was the rather primitive ammunition handling gear (a system of chain hoists and sliding pulleys), which made the job of loading quite lengthy and cumbersome.

Dahlgrens were manufactured in a variety of sizes, the largest being the 15-inch shell gun, which weighed 42,000 pounds and had a range (when firing shells) of 1,700 yards.

THE PARROTT RIFLES

The principle of the Parrott gun was the same as that of the Dahlgren: the pressure at the breech is greater than it is towards the muzzle. The breech of the Parrott was strengthened by shrinking a 1-piece cylinder around the barrel at the breech. This gave the Parrott a characteristic stepped appearance, somewhat like a telescope.

The Parrotts were rifled, and fired either solid shot or shell. The largest Parrott, the 150 pounder, had an 8-inch bore diameter and weighed 16,500 pounds. Its range was 2,100 yards.

THE BROOKE RIFLES

The Confederate Brooke Rifles (developed by the same Lieutenant John Brooke who was responsible for the *Virginia*) were quite similar to the Parrott rifles, the main difference being that, instead of one breech band, they were made up of several bands. In addition to solid shot, the Brookes fired spherical and conical shells, grape shot and cannister shells, and 6-foot-long triangular bolts similar to a harpoon. The weight of a 7-inch Brooke was 15,500 lbs. and the range about 2,000 yards.

The carriages of these guns varied with usage and on the whole were quite sophisticated. The guns could be elevated by means of a large screw which passed through a lug at the breech. The smaller ones were mounted on a two-wheeled Norsilly carriage which used a block and tackle recoil system. The larger ones were mounted as pivot guns, also using a block and tackle recoil system. On the monitors a complicated system of gears, and a friction brake not unlike a modern automobile brake drum, was used.

Appendix II*

1

Letter of Rear-Admiral DuPont on the qualities of the Monitor vessels for blockading duty off Charleston.

FLAG-SHIP WABASH,
Port Royal Harbor, S. C., June 3, 1863

SIR: I had the honor in a previous despatch to report to the department the necessity of increasing the vessels in this squadron, in order to make the blockade more effective, particularly off Charleston.

I desire now to call the attention of the department to another important point in connexion with the blockade of this coast.

It has hitherto been maintained by wooden vessels, many of which are of the most vulnerable character, but the time is approaching when they will be liable at any moment to be driven off by iron-clads of the rebels from the harbors of Charleston and Savannah, and, if reports speak true, by iron-clads from abroad. To meet this serious difficulty I have only one vessel which can do outside blockading duty, and that is the New Ironsides, and her commander expresses doubts of her ability to remain off Charleston in the hurricane season. The other iron-clads, the Monitors, and particularly in the coming hot season, are totally unfit for this duty. They are not sea-going or sea-keeping vessels. In even a slight sea the hatches must be battened down, and the effect upon the crew, if continued for a brief period in hot weather, would be most deleterious; indeed, in such weather they are not habitable; but, in addition to this very serious objection, the speed of these vessels, owing to the foulness of their bottoms, is so slow that they are not only unfit to chase, but in a gale of wind could not keep themselves from going ashore. Even in a strong tide-way, owing to the deficiency or weakness of their ground tackling, they frequently get adrift. These vessels can maintain a blockade in inland waters, but the nearest point to Charleston where they can be placed is North Edisto.

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* Appendix II is reprinted from the *Report of the Secretary of the Navy in Relation to Armored Vessels,* published by the U.S. Government Printing Office in Washington in 1864.

I have on different occasions referred to the qualities of these iron-clads for keeping the sea, but I deem it my duty to call the attention of the department to them in an especial despatch.

In this connexion, I forward a copy of a letter from the commanding officers of the iron-clads, addressed to me when they understood it might be deemed necessary to order them on blockading duty off Charleston.

Very respectfully, your obedient servant,

S. F. DUPONT,
Rear-Admiral, Commanding, &c.

Hon. Gideon Welles,
Secretary of the Navy, Washington, D. C.

2

Rear-Admiral Goldsborough's opinion of iron-clads.

WASHINGTON CITY, *February* 26, 1864.

SIR: In obedience to your instructions, I beg to submit the following remarks on the subject of iron-clads:

The problem is yet, so to speak, but inchoate. In truth, the still continued and startling developments in ordnance are alone enough to keep it in abeyance. They, in short, together with the general use of steam and the substitution of iron for wood, have completely ignored and consigned to history numerous ideas formerly regarded as fundamental, and thus imposed a new necessity for others in their stead, many of which, to say the least, are extremely perplexing. Hence the remarkable state of transition which now pervades the naval world.

Notwithstanding all that has been done, and the enormous expenditures incurred, to secure an invulnerable hull *throughout*, and to guard, at the same time, against too great a sacrifice of sea qualities and other essential attributes, but, at least, an indifferent success has been reached in any quarter, and this condition of things, coupled with an appreciation of the inherent difficulties involved, has already induced some respectable minds abroad, if not among ourselves, to despair of accomplishing much more. The efficiency or intrinsic worth of an iron-clad, intended for the ocean or for coast purposes, is to be estimated according to her strength throughout *every part* of the hull, her sea qualities, the disposition and character of her battery, and the ability of its use in all cases of fighting weather; the efficiency of height of her deck above the water to resist the vaulting efforts of a spoon-bowed opponent; the substantive protection afforded by her plating; her capacity to move rapidly and turn quickly; her space for requisite accommodations; and (pardon the word) her habitability.

These are the essential properties that constitute the offensive and defensive powers of the vessel, and all of them bear so intimately upon efficiency that no one of them can be disregarded or neglected with impunity. To unite them all in one hull, with sufficient harmony, is the problem in view, and, I repeat, it is one yet to be solved.

The Warrior, the *chef d'œuvre* of iron-clads, in the minds of some, has been produced, but it is vain to claim for her the renown of embodying its solution, when we are told, unquestionably, that she rolls in a sea-way 38 degrees, and when we know that the ditto of her sides has been both penetrated and smashed readily; that her extremities are unguarded, and that her capacity to turn quickly depends upon the efforts of a solitary screw acting upon her great length.

Apart from the consideration of the effect of plating upon sea qualities, strain of bottom, &c., costly and carefully conducted experiments afford us no hope that a sea-going vessel-of-war can be covered with iron *throughout* her vulnerable parts, so as to render her proof against the penetration of rifle projectiles at even a tolerably near fighting distance, or against the still more destructive effects of large round shot, impinging with high velocity.

It is very clear that no vessel confined to rational dimensions can support, throughout her exposed parts, more than a very limited thickness of iron plating; and, already, a greater thickness perhaps than she can thus support, and still remain fit for the ocean, has been penetrated even by shells, under certain favorable conditions. They, at any rate, when of great size and with large bursting charges, have been made to penetrate a thickness of at least five and a half inches, and to do destructive smashing work besides. But it should be borne in mind that penetration is not indispensable to the destruction of either plates or vessel. Any iron plate that can be applied to a vessel—indeed, I might perhaps say any that can be forged—can be smashed to pieces by the round shot, if not shells, of a powerful gun; and, again, any iron vessel certainly can be sunk by such projectiles in the absence of entire penetration on the part of any of them. The blows received must necessarily be expended upon her—must be taken up by her—and, ultimately, their effect in the way of vibration would be to break her fastenings of rivets, and thus produce, beyond question, I think, a destructive leak, more especially if delivered from a concentrated broadside of such guns against a vessel with a thin or weak bottom, in comparison with her upper works. The strength of bottom, compared with that of upper works, of an ordinary wooden vessel, is much greater than it is or can be in any iron-clad; yet, it is obvious that no vessel requires such absolute strength, in this patricular, as the latter. It is a feature of vital importance, and one, therefore, deserving the most serious attention.

The destruction of plates by the process of smashing would undoubtedly result far more disastrously to the vessel than though they were simply penetrated by non-explosive projectiles, or rifle bolts, elsewhere than below the water-line.

Iron conveys vibration with wonderful facility, and is therefore regarded as a perfect conductor in this respect; and, hence, a leak in the bottom of an iron-clad once produced, as mentioned, could scarcely fail to spread itself rapidly, and thus, in all probability, consign her to the bottom either during a contest or no great while afterwards.

The Weehawken had been struck one hundred and thirty-seven times by the projectiles of the enemy up to the time of her sinking in the harbor of Charleston, a few weeks after her last engagement, and it would be well, I think, to ascertain, on her recovery, the real cause of the disaster. It may have proceeded from vibration produced by shot.

If any solid benefit is to be derived from iron plating applied to a sea-going vessel—any benefit commensurate with its cost and probable efficacy—it is quite apparent to my mind that it is only to be done by limiting its use to her most vitally exposed parts, and having it of such practicable thickness as to secure immunity in those places against the explosive effect of shells generally, and against the damaging effect of other projectiles striking obliquely, or otherwise unfavorably to the material injury of iron; and the vessel so provided, when required to perform fighting service in harbors or rivers, might have chain cables faked over the unplated parts of her hull as a temporary expedient. In connexion with this way of using plates, effective water-tight bulkheads are indispensable. A hull arranged after this fashion, with turrets for the battery, is, I conceive, about all that can be done in the way of plating with iron, consistently with all the considerations involved; and even this would be of but poor account unless the other elements of efficiency mentioned above were duly secured.

Among those elements is that of celerity in turning, and as it is a point to which sufficient attention has not been given hitherto, I wish to impress my convictions in regard to it.

Every iron-clad, as a matter of course, should be an unexceptionable ram; or, in other words, susceptible herself of being used as a projectile. This, however, cannot be the case unless she can be directed with a great degree of promptness to any desired quarter, or turned with every degree of quickness necessary. But celerity in turning is not to be estimated only by the advantage it gives in offensive movements, for it is also of the greatest consequence in defensive operations, and, as an instance, it confers the power to parry, generally, the intended blow of an antagonist ram, if not to avoid it altogether frequently. The offensive and defensive qualities of a vessel-of-war are so inseparably connected that each, generally, if not always, constitutes an essential part of the other. They, in fact, occupy a Siamese relation.

In regarding the value of celerity in turning, it may be well to consider the fact that it is utterly idle to attempt the construction of a sea vessel with the hope of rendering her able to resist the blow of a formidable ram. No combination of any materials known can possibly accomplish this end. Even the Warrior, although a vessel of vast size and enormous strength, could be crushed by a ramming blow from the Dictator, as though she were nothing more than an immense egg. Indeed, she could be crushed to destruction by a blow of the sort from a vessel greatly inferior to the Dictator in momentum. To appreciate these assertions fully, scarcely more is necessary than to compute the momentum of the Dictator arising from her weight of 4,500 tons, when, at her normal draught of twenty feet, impelled with a velocity of fifteen knots per hour, or twenty-five feet per second. It sums up to two hundred and fifty-two millions of pounds, and is, therefore, equal, in point of shock, to that of a ball weighing two hundred and fifty-two thousand pounds (more than a quarter of a million) striking with a velocity of one thousand feet per second; or, to that of an iron ball, ten feet two and three-quarter inches in diameter, striking with that velocity.

This comparison, it will be perceived, concerns only the force of the blow. As to whether the vessel or ball would produce the greater destructive effect, the very wedge-shaped and cutting bow of the former, contrasted with the bluff front the latter would necessarily have to present, is, I suppose, enough to settle the question.

To my apprehension the Dictator, with a velocity of fifteen knots, on striking favorably for the purpose any sea vessel whatever that either now exists or ever will exist, would infallibly cause her to separate almost immediately into two parts. Even an oblique blow from her might work terrific results, and it is by no means certain that a direct one would not be sufficient to split an iceberg of formidable dimensions. Nor, judging from what is known of kindred collisions, would the probability of escaping disastrous injury on delivering the blow against even a vessel of the Warrior's stamp be unfavorable to the Dictator, if only her bottom were much better calculated than it is to withstand violent vibration, and as strong as it seems to me it ought to have been made to be in keeping with her massive and ponderous upper works and the kind of service she is liable to be called upon to render?

But, to return to the point of celerity in turning, no practical means, in my judgment, should be neglected, more particularly in the construction of an iron-clad, to secure this cardinal quality; and, drawing my conclusions from experiments that have been made, and discussions that have followed them, I am induced to think that the system of turn-screws and independent engines affords the very best means extant of accomplishing the purpose.

With the same application of power, it is said to afford not only a higher velocity than the single screw, but a vastly superior facility in turning. The simple fact that backing on one side, and going ahead on the other, can take place simultaneously, is enough to settle the point. And there is also claimed for it another great advantage, the facility of steering independently of the rudder, or of guiding effectually when the rudder can no longer be used, by merely varying the force of either screw according to circumstances. These are but the more prominent advantages of the system. There are others of an incidental character which are regarded as of consequence, but it is, perhaps, unnecessary for me to dwell upon them on this occasion. I will remark, however, that this system of propulsion is extending itself in England, if not elsewhere.

Velocity, involving as it does the capacity of prompt presentation wherever required—of making, in effect, the vessel herself a terrific projectile; of turning rapidly, and of avoiding hostile demonstrations whenever necessary—is of such primary importance that an insufficiency is to be regarded as fatal to efficiency. With regard to the interesting and mooted question of guns best suited for an iron-clad, which must of necessity be comparatively few, owing to the large proportion of floating power absorbed in giving requisite strength, and by the application of plates, I am decidedly of the impression that, as a very general rule, those adapted to round shot are greatly to be preferred, provided they be of the largest calibre that can be used with facility and safety, and at the same time calculated to throw their shot with a high initial velocity; and I say this because I attach a much higher consequence, on the score of general destructive effect, to the smashing influence of solid round shot than to the boring results of rifle projectiles, not that I am disposed, however, by any means, to ignore rifled guns, but that I am inclined to a restriction of their use, and to make them the exception and never the rule either for iron-clads or any other class of war vessel. In truth, the work to be done should be the criterion of choice between the two, or with regard to their association. If, for instance, the object to be accomplished were one on shore, within the effective reach of the rifle, but beyond that of the smooth-bore, it is clear that the latter would be quite useless for the occasion; but, on the other hand, if it were assailable effectually by the latter, the preference, to my view, as a very general thing, should be given to it, using the other, however, in a complementary way, or to the extent that it would probably facilitate smashing by boring. Considering, though, the general purposes an iron-clad is intended to subserve, and to answer the question as to the kind of armament she should have in general terms, I say, unhesitatingly, give her all smooth-bores of the sort mentioned above; more especially when the necessity of the case imposes the condition of a very limited number of guns. An effective Parrott rifle, associated with smooth-bores in cases where the latter are not really few in number, as a permanent arrangement, would no doubt prove advantageous in the general course of service; and I beg to state that I distinguish this rifle purposely above all others, because I believe it to be by far the best for naval purposes that has been produced by any of our projectors, and fully equal, if not superior, to any that has been produced elsewhere of which I have any information. It is, perhaps, not as generally known as it should be, that this gun admits, without the slightest detriment, the free use of round shot, an advantage of much moment at times; but this is only one among the number of merits which constitute its intrinsic and distinctive worth.

A difference of opinion also exists among naval minds, both at home and abroad, as to whether the better expedient is to use the guns of an iron-clad *turretwise*, or in broadside ports under a covering plated deck. For my own part, I have little doubt upon the subject, particularly if the vessel herself be confined, as in my judgment she ought to be, to moderate dimensions —to such, in effect, as, with a high velocity, will offer sufficient momentum, used as a ram, to crush effectually any antagonist whatever, capable of sea-service; and more than this, to my apprehension, is obviously worse than superfluous.

The turret I regard as decidedly preferable, and mainly for these reasons: It renders one gun of a class equivalent to at least two of the same disposed in opposite broadside ports, and this with a great reduction of crew. It admits the use of much heavier guns. It does not necessarily involve a breadth of beam antagonistic to velocity. It affords a better protection to guns and men, and, withal, it secures the fighting of guns longer in a sea-way.

But, to derive all the benefits from a turret of which it is susceptible, I am quite persuaded that no fastenings of rivets should be used in its construction. The device of a jacket, or interior lining, to prevent broken fastenings from flying inwards injuriously, is, at best, but an incomplete alternative; for although it may, and does undoubtedly, answer that end, yet at the same time it conceals from detection the great number of those fastenings that are broken by vibration, and do not fly from their places, or scarcely start at all; and it is very evident that it exerts no influence to check disintegration of the turret itself, occasioned by the effect of vibration in sundering rivets.

It is no sufficient answer to these remarks to urge the difficulty of constructing a competent turret without the use of rivets. I am aware of it, but still I am satisfied that it can be overcome; and furthermore, that it may be at an early period, if our artisans are challenged and encouraged to the task. When it is, a very superior order of turret will result.

According to my impressions, a gun of 12,000 pounds is about the heaviest that can be used to advantage in the *broadside ports* of any vessel whatever; and I would respectfully urge that one of this weight, cast upon Rodman's method, shaped essentially according to the form determined by Bomford, bored as a IX-inch in every particular, and intended for a normal charge of powder of twenty pounds, be prepared forthwith, and submitted to searching experiment; for whether iron-clads are or are not to have broadside guns to throw the heaviest round shot with the highest velocity that circumstances will permit, other vessels will certainly require them; and as no gun of this character now exists in our navy, I take the liberty of suggesting the one in view as an attempt to fill the void.

Could the Cumberland have thrown her solid IX-inch shot with a charge of twenty pounds of powder, and kept recoil under control, the Merrimack, in my belief, would have fared very differently. It is true she might still have rammed the former as she did; but in lying near at hand afterwards, if not in passing by at a close range previously, with the view of turning for the purpose, her protective plating would, I think, have been damaged sorely, and to an extent forbidding further efforts, perhaps comprommitting safety, and thus, probably, the Congress and many lives, at least, might have been saved, and much subsequent annoyance avoided. I am not sure that the Cumberland did use in her nine-inch guns, generally, a charge of powder of more than ten pounds, but I am quite confident that she could not have used in them, at any time during the action, one of more than thirteen pounds—the maximum prescribed. Even with the charges she did use, the Merrimack's plating was sensibly injured, and all that was wanting to bring about the results of which I speak was, a material increase of projectile velocity, such (I repeat my belief) as charges of twenty pounds of powder applied to similar though considerably heavier guns would have conferred. I am told, upon authority, that the present IX-inch guns are capable, in strength, of throwing their solid shot with a charge of twenty pounds of powder. That they may be; but no one of any experience, I take it, will venture to advocate the use, with solid shot, of a higher charge to those guns than the one now allotted as the maximum; no one, I am sure, who has witnessed on board ship the effect of the recoil of those guns when fired for awhile with solid shot and with this maximum charge. Nor, to speak frankly, have I much faith in the sufficiency of the gun itself to withstand a higher charge with solid shot.

I only ask that a fair and thorough trial of the gun I propose—a trial to determine its relative merits, in every respect, as a broadside gun to throw the heaviest solid round shot with the highest velocity that circumstances will permit—may be made.

I am fully aware that the New Ironsides has now on board still heavier guns, and of larger calibre, carried broadside-wise—guns of 16,000 pounds in weight and eleven inches in calibre—but I am not aware that either they, or their carriages, which occupy unavoidably so much space, have been subjected continuously, in action or at sea, to the effect of the use of solid shot, with charges of powder approaching one-fourth the weight of the projectiles. The test no doubt would prove palpably excessive in many respects. In all the actions of this vessel off Charleston, the rule with her, as I understand, was loaded shells with corresponding charges; and if she ever has resorted to solid shot, with a large increase of charge, I am uninformed of the fact.

As already intimated, a marked pause must occur in the progress of ordnance before a fixed or definite conclusion can be reached as to the relative immunity obtainable by iron plates, even when of the best quality, and when applied in the most feasible manner. Absolute immunity is out of the question.

That progress has already produced the effect of restricting their application, in the case of sea-going vessels, to the more vitally exposed parts; and it is quite possible that it may yet do considerably more; that it may go on in the way of narrowing those limits, and bring them down first to *some* only of those parts, and finally to establish the conviction that such plating, for such vessels, viewing impartially the *pros* and *cons*, is really of no marked consequence. This is no groundless speculation, however it may present itself at the first blush; for facts and deductions from experiments distinctly point to the conclusion. In the mean time the tendency of its effects must be to impress the value of rams, and thus of reviving a mode of naval warfare which, on a miniature scale comparatively, existed long before the invention of gunpowder.

The value of rams, at this very moment, cannot be overestimated. With a few of them in each of our prominent commercial ports, none scarcely of more than half the displacement or weight of the Dictator, no enemy, I care not how powerful, could blockade those ports successfully; for possessing the great advantage of biding and selecting their own time, they could so manage the delivery of their blows as to annihilate his vessels. Nor could those ports, in my judgment, be assailed successfully. The protection of harbors, now-a-days, does not lie in ports. They, for this particular purpose, are immeasurably effete, or, at most, but of subsidiary importance. It lies essentially in powerful steam rams, aided, when necessary, by obstructions in passage-ways. Is it the forts of Charleston, I would ask, that now secure the place from capture? Certainly not. They alone, or any other forts alone, (by which I mean in the absence of rams and obstructions,) can be passed by fast and powerful vessels with impunity, assuming, of course, that there is water enough to float them.

Rams, intended purely for harbor defence, would be better without than with guns. They themselves are to be the projectiles; or, if you please, they are to be the shot, and the steam is to be the powder; and the effect of both, properly combined, would be absolutely irresistible. Guns, I repeat, would be detrimental to unity of purpose, and also in other respects; or, in short, be of more harm than good in the long run. Besides, to fit the rams for them would be to swell the item of cost largely, and thus abridge their multiplication and the distinctive plating which their protection would involve could be used to more advantage elsewhere about the hull. The essential points to be secured in these rams, each to a degree as consistently with all the rest as practicable, are great strength throughout every part of the hull, not overlooking the bottom by any manner of means; every protection that supportable plating can afford; a high velocity; an ample security of machinery; the utmost rapidity in turning; and a suitable bow.

I have met with no ideas with regard to sea-going iron-clads that have impressed me so forcibly as those of Captain Coles, of the British navy; and I think his system, in the main, is about the best that can be adopted at present. In my humble opinion, he meets the difficulties of the case better than they have yet been met in any other quarter; and he displays throughout his exposition a fertility of resource, a fund of ingenuity, common sense, and professional experience, that confers upon him distinguished credit.

But to come more immediately to the requirements of your communication, it strikes me that it is inexpedient to construct iron-clads to perform only a particular service, except mere rams, unprovided with guns, for harbor defence, and also vessels for interior river operations, in a country like this, in case of intestine difficulty. They should, I think, be made to answer as many naval purposes as possible, and their cost alone, independently of other considerations, is enough to determine this question. All, therefore, barring the exceptions just mentioned, should, it seems to me, possess the attribute of seaworthiness; by which I mean the capacity of being sailed or steamed anywhere over the ocean, and of keeping the sea as long as a vessel of the class would probably be called upon to do so. Without this attribute their sphere of usefulness must inevitably be but local and contracted.

Putting the Galena aside as a sad mistake, and as unworthy of naval criticism, the Monitors we have already constructed and used in service I am impelled to regard as open to the serious objections of a marked deficiency in ability for general naval purposes, and in strength of bottom, seaworthiness, speed, turning qualities, height of deck above the water, and habitability; yet, for mere smooth-water harbor operations—the object, I suppose, for which they were intended—they undoubtedly do possess formidable offensive and defensive properties, viewed in a relative sense.

Their absolute worth, however, in these particulars, I cannot regard as entitled to the extravagant merit claimed for it, induced, I apprehend, in a great measure by conclusions drawn from the encounters of the first Monitor and Weehawken with the Merrimack and Atlanta, without a sufficient knowledge of the facts attending them, and without any (or more than an unwilling) reference to the cases of opposite results, as, for instance, the Ogeechee, and the repeated displays before Charleston. That the charm of novelty in construction, or quaintness in appearance, had anything to do with the matter, I will not undertake to assert, although I may, perhaps, be allowed to indulge suspicion as to probable effect. Popular opinion is not always right on such subjects, nor do I know that it is apt to be when it runs counter to popular naval opinion. At any rate, I do know that the latter is not likely to be very wrong in relation to professional matters of the kind.

Their offensive and defensive power, even for the kind of service they are alone expected to perform, is most materially marred or restrained, I conceive, by their disproportionate and inadequate strength of bottom, their exposed and ill-protected deck, and their want of speed, height of deck, and habitability.

If there be those who think that a bottom composed essentially of nothing more than ½-inch iron plates, secured to frames of angle iron 4 by 4 by ½, spaced 18 inches from centre to centre, and sustaining a stupendous, ponderous, and overhanging superstructure, is enough, or anything like enough, to endure the vibration to which an iron-clad is exposed under a severe fire from heavy guns, much less the terrific vibration when used as a ram, or, I might almost say, to endure the strain of that superstructure itself under all circumstances of exposure to weather to which the vessel is unavoidably liable in going only from harbor to harbor, I confess, frankly, that I am not one of the number. Two of the iron-clads in view—the Monitor and Weehawken—have already gone to the bottom, and neither was under fire at the time, nor had either been so very recently. The sinking of the Monitor was occasioned by an actual (though partial in extent) separation between the top and bottom upper works; but how much of this may have been due, if any at all, to the shock of all kinds she experienced in her struggle with the Merrimack, it is of course impossible to determine. But whether any part of this fatal disaster is or is not to be so ascribed, the fact of the separation itself is conclusive to my mind as to the insufficiency of relative strength between her top and bottom works; nor am I aware that this feature has been changed at all materially for the better in the construction of the other Monitors; nor, indeed, that it is susceptible of ample modification in the premises. As to the case of the Weehawken, I prefer suspending an expression of opinion until more is positively known in relation to it. She certainly went down in a most mysterious and startling way, yet under circumstances that *do* furnish grounds for conjecture. Besides the number of times she had been struck by the enemy's projectiles, and fired her own 15-inch and 11-inch guns, she had previously gone through quite a severe gale of wind at sea.

The deck of the Monitors has been penetrated at a distance judged to be 1,200 yards, and, therefore, it is a plain inference, considering its attitude, that at quarters close enough to render firing upon it at all plunging, the vessel herself could be readily sunk. To render this defect less glaring, additional plating, I believe, was to have been applied, and a quantity of it was sent to Port Royal for the purpose; but, on further reflection, the scheme, I am told, was generally abandoned as impracticable.

Their speed, after being in the water some little time, as I am informed by credible authority, is but, on the average, about 4½ knots, rather less than more. To trace this sad defect more at large than I have already done is a needless task. It proclaims its own consequences.

Their height of deck above the water, being, as I am also credibly informed, only some 12 or 15 inches, and their remaining floating power scarcely exceeding 200 tons, a strong temptation is presented to a light and active antagonist, with a curved or spoon-shaped bow, to bide his time and throw himself astride of it; nor have I the slightest doubt, particularly with their sluggishness of motion, that the attempt might be successful, and if so, that the result would be destruction.

And as to the remaining point to be remarked upon—the want of habitability—it is, in a warm climate or season, obnoxious to grave objections. The physical prostration it produces is inordinate, and hence a more frequent change of officers and others than is compatible with order or convenience is rendered a necessity.

The New Ironsides I regard as a much more efficient type of ironclad than the Monitors just discussed, because of her possessing decided advantages over them in the particulars of fitness for general purposes, seaworthiness, relative strength of bottom, or absolute capacity to endure vibration thereat, security against an antagonist vessel getting astride of her, speed, and habitability. Had she been planned for turrets, instead of to use guns at broadside ports, she would have been, I think, still more formidable; nor is she unexceptionable in other respects, and among them speed and turning qualities. It is necessary to try her more at sea, and more at closer quarters with an enemy, than she has yet been tried, in order to determine positively her relative merits in some highly important particulars.

The Roanoke, although presenting a powerful and well-protected battery, cannot, if I am correctly informed, be used at sea owing to her excessive rolling motion; and her great draught of water is a serious obstacle to her worth even for harbor purposes. She, also, is deficient in speed and turning qualities, and, indeed, in other respects. She is but a converted vessel, however, (to use a technical term,) gotten up under a pressing demand; and her plating, turrets, &c., can be transferred hereafter to a more suitable hull. I know too little of the iron-clads on our western waters to venture an opinion as to their merits; and as to those in the course of construction, or not yet commissioned, on our Atlantic seaboard, I would remark that their probable fitness to answer ends is to be measured by the prospect they present of combining the properties I have mentioned in an early part of this letter as essential to efficiency.

Considering the pressing and peculiar circumstances under which our iron-clads were produced—the newness of the problem itself, and its inherent difficulties—it is not in the slightest degree surprising that we have not achieved more satisfactory results. No desire to do the best that could be accomplished, and certainly no elevation of purpose nor energy, has been wanting in the proper quarter. The efforts we have made are so many lessons upon the subject, and they afford us the advantage of profiting by wholesome teachings. Experience is a great source of wisdom, and to be enabled to recede from error is a means of advancing in truth.

I have thus, sir, given you, somewhat at large, the views I entertain on the subject of iron-clads, and of those we have constructed, called for, most unexpectedly to myself, by your communication of the 3d instant. In arriving at the conclusions I express I have indulged no other disposition than to probe the subject itself, and to consult the good of our navy, well knowing from the character and position you sustain that any course of less candor on my part would have been as repugnant to your wishes as to my own inclination.

Very respectfully, your obedient servant,

L. M. GOLDSBOROUGH,
Rear-Admiral, United States Navy.

Hon. Gideon Welles,
Secretary of the Navy, Washington City.

3

Rear-Admiral Dahlgren's opinion of the Monitors.

Flag-Steamer Philadelphia,
Off Morris Island, January 28, 1864.

Sir: Conformably to the wishes of the department, I submit the following review of the services of the Monitors while under my command; and as some knowledge of the circumstances under which they have been tested may afford a better appreciation of their qualities, I shall briefiy narrate some of the leading events in which they have participated during the operations at this place.

On the 6th July Rear-Admiral DuPont delivered to me the command of the naval forces occupying the coast of South Carolina, Georgia, and part of Florida; they embraced seventy (70) vessels of all classes, and were distributed at various points along an extent of more than three hundred miles. There was no concentration, the purpose being rather to distribute the vessels in order to enforce an efficient blockade.

Of the iron-clads, the Ironsides was off Charleston bar, two Monitors were at Edisto, one at Stono, three at Port Royal, and one at Ossabaw.

The orders of the department (June 24, 1863) only directed me to assume the command; they went no further, nor was there need that they should. There was an enemy in front, and it was my duty to compel him to obedience, so far as my means permitted.

On the day that I arrived, an interview occurred with General Gillmore, in which the details for a descent on Morris island were arranged to commence on the Wednesday following, but which were postponed first to Thursday and then to Friday, in order to allow General Gillmore to perfect his arrangements.

In the absence of specific instructions, I was obliged to assume the responsibility of action, which the department was advised of.

The naval part of the operations consisted of—

1. In assembling the iron-clads at the Charleston bar, so as to cross at early daylight on the day named, to cover the attack of the troops, to prevent the arrival of re-enforcements during that attack, and to engage the rebel batteries, particularly Fort Wagner.

2. To furnish a convoy for the column that was to ascend to Stono, cover its landing, and shell James's island.

3. To guard the depots of the army at Hilton Head and at Seabrook during the withdrawal of the troops concentrated on Folly island.

I should here state that Mr. Ericsson had decided to increase the thicknesses of the pilot-houses of all the Monitors and add heavy circles of metal to the bases of the turrets and pilot-houses.

The three at Port Royal were already in hand for this purpose, and some progress had been made. A part of my preparation consisted in putting a stop to the work, and having the vessels fitted temporarily for service.

This was effected in season, and before daylight of the 9th of July the Monitors were off the bar, ready to pass in at the first sign of movement by the United States batteries on Folly island.

The plan was to open from the masked batteries on the north end of Folly island, cross the bar with the Monitors, and enfilade the rebel position on the eminences of Morris island, while the troops were to cross the narrow inlet which divides Morris island from Folly island when the proper moment arrived.

The obscurity of the night still rested on land and sea when I went on board the Catskill, (July 10,) and not a symptom of preparation on shore was visible to us.

It was important that the Monitors should not by their appearance give any intimation of what was meditated by being seen on the bar, until the details ashore were completed; so I waited the first fire of the batteries. This was not long coming, and I led with my flag in the Catskill, followed by Captains Fairfax, Downes, and Colhoun, in the Montauk, Nahant, and Weehawken. Steering for the wreck of the Keokuk, and passing it, the Monitors were laid in line about parallel to the land, opposite the southern eminences of Morris island, and poured in a steady fire among the rebel garrison, who were there posted, making a feeble and ineffectual return to the storm of shot and shell that came upon their front and flank. I could see plainly the great confusion into which they were thrown by this sudden and overwhelming onslaught. It was a complete surprise, both as to time and to power developed.

The Monitors were run in as close as the shoal waters permitted, so that the shells from our own batteries on Folly island passed close ahead of and at times over some of them.

About 8 o'clock a body of men were seen coming over the low sand beach of Morris island, and while hesitating whether to treat them to some volleys of grape, the sight of the Union flag * told who they were. They composed the brigade which had been brought from the Folly river by the boats of the squadron under Lieutenant Commander Bunce and Lieutenant Mackenzie.

I paused for a moment to observe the gradual accumulation of our men in masses, and their advancing movement; then pushed forward to accelerate with our enfilading fire the retreat of the rebels.

The sight was now of great interest. Our own troops could be seen taking possession of the sand hills where the enemy had rested the sole defence of this end of the island, while some battalions were moving along the

* The first planted on Morris island by Lieutenant Robeson.

beach. The defeated rebels were hurriedly making way along the low flat land north of their position, and some two or three detached dwellings were in flames, while the Monitors skirting the shore maintained a steady fire on the retreat. Presently they reached Fort Wagner, and here we were advised that our advance was checked, at least for the day, though it was but 9 o'clock. The discomfited rebels were safe in the work, and our own men halted at a reasonable distance from it.

The Monitor with my flag was now anchored as near the beach as the depth of water permitted, (twelve hundred yards,) and the other Monitors in line to the southward. A steady fire was begun about 9.30—the fort replying briskly—and maintained through the day, except the dinner hour, until six in the evening; then I retired and anchored lower down.

Next morning before six o'clock the flag-lieutenant reported to me that an assault had been made at daybreak by our troops and failed, and about nine o'clock I had a note in pencil from the general, saying: "We attempted to carry Fort Wagner by assault this morning and reached the parapet, but the men recoiled and fell back with slight loss."

It is known *now* that re-enforcements had been hurried to the island by the rebels, and had entered the work about midnight.

I had no notice whatever of the general's intent, and could, therefore, render no aid in time.

Here ended the first part of the enterprise against Morris island. It had been in all respects a surprise, and so complete that the rebels do not seem to have had any idea of it until the day before; and it is not certain they were then aware of the scale on which it was to be conducted.

Had a work like Wagner crowned the sand hills of the south end, we could not have established our position on the island—even a surprise would probably have been out of the question. But there were to be no more surprises—the undertaking was to be completed only by hard work patiently endured in the trenches, and by batteries ashore and afloat.

The general now decided to make a second assault in force, and to cover it by some light batteries established at distances varying from one thousand to seventeen hundred yards.

While the preparations for this design were going on the Monitors were daily at work to occupy the attention of Wagner, and keep down its fire —the gunboats assisting at long range.

On the 18th July, all being ready, about noon I led up in the Montauk, followed by four Monitors and the Ironsides, anchored at twelve hundred yards, as near as the state of the tide would permit, and opened fire—the gunboats firing at a greater distance, and the shore batteries also in action.

As the tide rose the Montauk gradually closed in, until at seven o'clock she was about three hundred yards from Wagner, when I ordered grape to be used. Unable to endure the fire of the vessels the guns of the fort were now silent, and not a man was to be seen.

About sunset a note in pencil from General Gillmore announced his intention to assault, but it was quite dark before the column reached the work. The fire of the vessels was continued so long as it was safe for our own men ashore, but ceased when the darkness made it impossible to distinguish friend from foe. The rattle of musketry soon made known the commencement of the assault, and continued with little intermission until 9.30, when it ceased, and then came the painful tidings of our defeat.

This was the end of the second part of the operation, and proved that the work was too strong and too pertinaciously defended to be taken by any off-hand blow. The slow and laborious operation by trench and cannon only were capable of reducing it.

And here I may remark, that in this necessity is to be found a principal cause for the delay in reaching Charleston that subsequently ensued. It was no doubt unavoidable, for it is to be presumed that no more troops could *then* be spared from the main armies. If there had been sufficient to make such an assault as would have overpowered all opposition, Wagner might have been carried at the first assault, Gregg would have yielded immediately, Sumter would soon have followed as a matter of course, and the iron-clads, untouched by severe and continued battering, would have been in condition to come quickly in contact with the then imperfect interior defences.

The rebel movements clearly indicate that they admitted the impracticability of defending Morris island, and consequently Sumter, after our position on it was fully established and covered by the iron-clads. They only sought to hold the island long enough to replace Sumter by an interior position; hence, every day of defence by Wagner was vital to that of Charleston.

This policy was successful for two months, (10th July to 7th September,) and gave time to convert Fort Johnson from a forlorn old fort into a powerful earthwork—improved by the experiences of Wagner. Moultrie received similar advantages, and most of the cannon of Sumter were divided between Johnson and Moultrie. Batteries were established along the south shore of the channel from Johnson towards the city; and thus an interior defence was completed which, though it separated more widely the salient and principal works of the defence, by substituting Johnson for Sumter, yet rendered access to the upper harbor far more difficult, because a more powerful fire was concentrated from additional batteries upon vessels attempting to enter.

And thus it was that, even after Morris island was evacuated and Sumter dismantled, the fleet must still pass the fire of Moultrie and Bee to find itself in presence of a formidable earthwork, supported by continuous batteries, and commanding obstructions more difficult than any between Sumter and Moultrie.

The real nature of these obstructions was not suspected until the winter freshets had broken away and floated into our hands a fair specimen of them, which were certainly far more formidable than had been anticipated.

So well do the rebels keep their counsel that the best informed refugees, who had been constantly engaged about the harbor, appeared to know as little about them as we did.

During the progress of the engineers towards Wagner the iron-clads played an important part, using their guns whenever an opportunity, offered as shown in the instances quoted on page 583. It may be readily conceived, that, all things being equal, it was just as easy for the rebels to have worked towards our position as it was for our troops to work towards theirs. But there was a serious difference in the fact that the cannon of the iron-clads, and also of the gunboats, completely enfiladed the entire width of the narrow island, and absolutely interdicted any operation of the kind on the part of the rebels. In addition, whenever their fire was bearing severely on our own workmen, a request from the general always drew the fire of the vessels; and I do not know that it failed to be effective in any instance.

As a consequence the rebels were restricted to Wagner, and were powerless to hinder the progress of the trenches that were at last carried into the very ditch of the work, and decided its evacuation without assault.

The day before the contemplated assault, I led in the iron-clads in force, as agreed on, and battered the fort all day, tearing it into a sand heap.

The next morning it was to have been stormed, but the enemy had fled: they foresaw the inevitable result.

The vessels thus shared fully with the army in the operation that led to the abandonment of the works on Morris island, and besides what is already mentioned, prevented the access of re-enforcements or their accumulation between Wagner and Gregg.

The boats of the squadron were also engaged on picket duty by night along the sea-shore of Morris island, and the little stream on its inner border.

A detachment of seamen and marines, under Captain Parker, participated in the practice of the batteries at Fort Sumter, by working four navy rifle cannons, landed for the purpose.

The duties of the iron-clads were not performed under idle batteries. The guns of Wagner never failed to open on them, and fired until their crews were driven, by those of our iron-clads, to take shelter in the bomb-proofs. One of these cannon, a 10-inch, left deep dents on every turret, that will not easily be effaced.

The operations of the iron-clads against Morris island were appropriately closed by a severe contest with Fort Moultrie, Batteries Bee, Beauregard, &c., to relieve the Weehawken, which had grounded under their fire, and was finally got off with some severe injuries, owing to the falling tide having exposed the hull under the overhang.

There were other occasions when severe conflicts occurred with the rebel works on Sullivan's island.

And besides the principal attacks in force, there were few days from the first attack on Morris island (July 10) to its evacuation (September 7) that some iron-clads or gunboats were not engaged in firing at the enemy's works, so as to facilitate the labor of our troops ashore, as will be perceived by the following sample from the record:

Date.	Object.	Vessels engaged.
1863.		
July 18	Assault on Wagner	Montauk (flag,) Ironsides, Catskill, Nantucket, Weehawken, Patapsco; gunboats Paul Jones, Ottawa, Seneca, Chippewa, Wissahickon.
July 22	Wagner	Nantucket, Ottawa, (gunboat.)
July 24	Wagner, to cover advance	Weehawken, (flag,) Ironsides, Catskill, Montauk, Patapsco, Nantucket; gunboats Paul Jones, Seneca, Ottawa, Dai Ching.
July 25	Wagner	Gunboats Ottawa, Dai Ching, Paul Jones.
July 28	Wagner	Weehawken, Catskill, Ottawa, (gunboat.)
July 29	Wagner	Ironsides, Patapsco.
July 30	Wagner	Ironsides, Catskill, Patapsco, Ottawa, (gunboat.)
July 31	Rebel batteries on Morris island	Ottawa, (gunboat.)
Aug. 1	Wagner	Montauk, Patapsco, Catskill, Weehawken, Passaic, Nahant, Marblehead, (gunboat.)
Aug. 2	Wagner	Ottawa, Marblehead, (gunboats.)
Aug. 4	Wagner	Montauk, Marblehead, (gunboat.)
Aug. 6	Wagner	Marblehead, (gunboat.)
Aug. 8	Wagner	Ottawa, Marblehead, Mahaska, (gunboats.)
Aug. 11	Wagner and vicinity	Patapsco, Catskill.
Aug. 13	Rebel batteries on Morris island	Gunboats Dai Ching, Ottawa, Mahaska, Wissahickon, Racer.
Aug. 14	Rebel batteries on Morris island	Gunboats Wissahickon, Mahaska, Ottawa, Dai Ching, Racer, Dan. Smith.
Aug. 15	Wagner	Mortar-boats Racer, Dan. Smith.
Aug. 17	Rebel batteries on Morris island, to direct fire from our batteries which opened on Sumter.	Weehawken, Ironsides, Montauk, Nahant, Catskill, Passaic, Patapsco; gunboats Canandaigua, Mahaska, Ottawa, Cimarron, Wissahickon, Dai Ching, Lodona.
Aug. 18	Wagner, to prevent assault	Ironsides, Passaic, Weehawken; gunboats Wissahickon, Mahaska, Dai Ching, Ottawa, Lodona.
Aug. 19	Wagner	Ironsides.
Aug. 20	Rebel batteries on Morris island	Ironsides; gunboats Mahaska, Ottawa, Dai Ching, Lodona.
Aug. 21	Sumter and Wagner	Ironsides, Patapsco; gunboats Mahaska, Dai Ching.
Aug. 22	Wagner	Weehawken, Ironsides, gunboat Montauk.
Aug. 23	Sumter	Weehawken, Montauk, Passaic, Patapsco, Nahant.
Sept. 1	Sumter and obstructions	Weehawken, Montauk, Passaic, Patapsco, Nahant, Lehigh.
Sept. 5	Between Sumter and Gregg	Lehigh, Nahant.
Sept. 6	Wagner and Gregg	Ironsides, Weehawken, Montauk, Passaic, Patapsco, Nahant, Lehigh.
Sept. 7	Batteries on Sullivan's island	Ironsides, Patapsco, Lehigh, Nahant, Montauk, Weehawken, (ashore.)
Sept. 8	Batteries on Sullivan's island	Ironsides, Patapsco, Lehigh, Nahant, Montauk, Weehawken, (ashore.)

I shall now briefly comment on the various qualities of the Monitors.
1st. Capacity for resistance.
2d. Power of ordnance.
3d. Draught of water.
4th. Speed.
5th. Number of crew.

1st. *Endurance.*—During the operations against Morris island the nine iron-clads fired eight thousand projectiles, and received eight hundred and eighty-two (882) hits. Including the service at Sumter in April and the Ogeechee, the total number was eleven hundred and ninety-four (1,194,) distributed as follows:

Service of iron-clads. South Atlantic blockading squadron. Shots fired and hits received by them during operations against Morris island.

Vessels.	No. of shots fired.		Hits.	Hits April 7, 1863.	Hits at Ogeechee.	Total hits.
	15-in.	11-in.				
Catskill	138	425	86	20	. .	106
Montauk	301	478	154	14	46	214
Lehigh	41	28	36	. . .	. .	36
Passaic	119	107	90	35	9	134
Nahant	170	276	69	36	. .	105
Patapsco	178	230	96	47	1	144
Weehawken	264	633	134	53	. .	187
Nantucket	44	155	53	51	. .	104
Ironsides	. . .	4,439	164	. . .	. .	164
Total	1,255	6,771	882	256	56	1,194

	No. of shots fired.	Weight of proj. fired, in tons.
By Ironsides	4,439	288½
11-inch, by Monitors	2,332	151½
15-inch by Monitors	1,255	213½
Total	8,026	653½

Of the eight Monitors, one was always absent at Wassaw (Nahant or Nantucket) to blockade the rebel ram. The Lehigh did not arrive until August 30, therefore was only able to participate in the operations of the remaining seven days, but did good work.

For some time only five Monitors were available for general attack, and then six, which was the greatest number disposable at any one time.

The consequences of the protracted firing and hard usage to which the Monitors were exposed during these two months of incessant service, were unavoidably very considerable in the aggregate; and the greater, also, that all repair which could possibly be dispensed with was postponed to the conclusion. It was therefore necessarily extensive when entered upon. The battering received was without precedent. The Montauk had been struck two hundred and fourteen (214) times; the Weehawken one hundred and eighty-seven (187) times, and almost entirely by 10-inch shot. What vessels have ever been subjected to such a test?

It is not surprising that they should need considerable repair after sustaining such severe pounding for so long a time, but only that they could be restored at all to serviceable condition. The force of the 10-inch shot must be experienced to be appreciated. Any one in contact with the part of the turret struck falls senseless, and I have been nearly shaken off my feet in the pilot-house when engaging Moultrie.

All the little defects of detail were marked by such a searching process. Decks were cut through; cannon were worn out; side armor shaken; tops of pilot-houses crushed, &c. But all these were reparable, and no vital principle was seriously touched.

With such workshops and means as a northern navy yard includes, the repair of all Monitors would have been speedily executed; but when machinery, tools, labor, and material have all to be obtained, as they were here, from a great distance, there was of necessity considerable delay; and, moreover, it was not admissible to withdraw but a portion of the Monitors at a time from the blockade.

The additions that were deemed advisable for strengthening the pilot-houses and turrets were also put on at this time, and the bottoms cleaned, for they had now become so foul with oysters and grass that the speed was reduced to three or three and a half knots, and, with the strong tide of this harbor, added considerably to the difficulties of working the vessels properly under fire.

On one night I was caught by heavy weather from the southeast while close up to Sumter, when I had gone to attack it, and it was well that the darkness of the night prevented the slowness of our motion from being perceived while extricating the Monitors from their position.

Power of ordnance.—Each turret contains two guns, and from the peculiar facility which it has for giving direction to the heaviest ordnance, no doubt, arises the desire to make these of the heaviest description. How far other considerations should control the character of the ordnance is necessarily an unsettled question.

To strike an armored ship it may be best to use a gun capable of the greatest power; but whether this shall be derived from a projectile of great weight, driven by low velocity, or of less weight, and high velocity; whether it shall be a fifteen-inch gun, fired with thirty-five or forty pounds, or a thirteen-inch, fired with fifty pounds of powder, is not here material; the weight of the gun for either purpose will not vary to any important degree. But in operations against earthworks, whose material cannot be damaged permanently, but only disturbed, and which are only to be dealt with by keeping down their fire, a much lighter projectile would be preferable, in order that the practice may be as rapid as possible. Hence a piece of 16,000 pounds for ten-inch or eleven-inch shot and shell.

When a number of Monitors are brought together it would be better also to have guns of like kind in each turret, and bring into action whichever might be preferable. Each of the Monitors of this squadron had a fifteen-inch and a smaller gun, (eleven-inch or eight-inch rifle,) and hence the rapidity of fire, which was most desirable, was not attained. That this was due to the calibre of the gun, and not to its being located in a turret, may be shown by one notable instance.

November 9, 1863, the Montauk, Captain Davis, was engaged in battering Sumter. In so doing the eleven-inch gun fired twenty-five shells successively in one hour, of which twenty-one hit the wall of the fort aimed at —distance sixteen hundred yards. This is at the rate of one shell in 2.4 minutes, which is not only rapid but also exceedingly accurate practice. There is no reason why another eleven-inch, if placed in the adjoining carriage, (instead of the fifteen-inch,) could not have been fired in the same time, at which rate that Monitor would have delivered an eleven-inch shell every 1.2 minute.

The rates of fire reported for the Ironsides, by Captain Rowan, are—

	Time. *h.m.*	No. fired.	Time for each fire. *m.*
Most rapid	0.50	25	1.74
Continuous	2.55	490	2.86
Assumed	1.00	360	1.33
Montauk	1.00	25	2.40

It will be perceived that for a short space of time the frigate delivered a shell from each gun in 1.74 minute, for three hours in 2.86 minutes, and it is believed that a fire could be sustained at the rate of 1.33 minute. The last rate is therefore possible, but I am sure it would be difficult to sustain it long with much regard to good aim and considerable distances; and I believe, on the whole, that for every practical purpose there would be all desirable rapidity of fire from the eleven-inch in turret. Thus it is to be presumed that there will be equality of ordnance power in the same number of eleven-inch guns as to rapidity of fire, whether in a turret or broadside.

Draught of water.—The Monitors of the Passaic class draw about eleven and a half (11½) feet of water when properly trimmed. On this coast ten and eleven feet is the most convenient draught of water for penetrating all the principal sounds and rivers and navigating them to any extent. A greater draught restricts a vessel in movement, and in many instances excludes her from several ports, except under very favorable circumstances.

Speed.—The speed of the Monitors is not great, (seven knots,) but it is quite respectable with a clean bottom, and is fully equal to that of the Ironsides. Their steerage is peculiar, but, when understood and rightly managed, not difficult of control. They pivot with celerity and in less space than almost any other class of vessel.

Number of men.—The number of men required to work them and the guns is only eighty, which is very moderate.

In common with all iron-clads, the scope of vision is much restricted, for the plain reason that in such vessels apertures of any size must be avoided. There are some other defects, but they are not inherent, and it is believed are susceptible of being remedied wholly or in part. So much for the Monitors.

The Ironsides is a fine, powerful ship. Her armor has stood heavy battering very well, and her broadside of seven eleven-inch guns and one eight-inch rifle has always told with signal effect when opened on the enemy. Draught of water about 15½ to 16 feet. Speed six to seven knots, and crew about four hundred and forty men.

The defects of the vessel are the unplated ends, which are consequently easily damaged by a raking fire, and involve the rudder and screw more or less, while she can return no fire in either direction. This was particularly and frequently inconvenient in attacking the works on Morris island, for at certain stages of the tide vessels tail nearly across the channel, and present bow and stern to the beach of Morris island, so that sometimes it was necessary to delay placing the vessel in position, and at others she would swing around very awkwardly when engaged.

The Monitors, on the other hand, were almost equally well defended on all sides, and could fire in any direction. The Ironsides was also open to descending shot, and her scope of fire too much restricted by badly placed ports.

The desire for comparison which rages just now can easily be satisfied by bringing the above data in juxtaposition.

Just as they are, the Ironsides is capable of a more rapid and concentrated fire, which, under the circumstances, made her guns more effective than the fifteen-inch of the Monitors. On the other hand, she was restricted by draught to the mid-channel, was very vulnerable to a raking fire, and the direction of her own guns was very limited laterally.

The Monitors could operate in most of the channels—could direct their fire around the whole circle—and were almost equally well defended on all sides.

The defects in both classes of vessels are susceptible of being remedied partially or entirely. The defence of the Ironsides could be made complete, and that of the Monitors equally so. The armament of the Monitors could be perfected so as to give all desirable rapidity of fire, but by no contrivance could the Ironsides be enabled to use much heavier guns than those mounted. Yet when such changes were made as experience has suggested, there still would remain to the Monitors the lighter draught, choice of guns from the heaviest to the lightest, defensibility, and direction of fire around the whole circle; consequently the ability to carry a heavy battery into the least depth of water, with equal power of offence and defence in any direction, and that with half the number of guns carried in broadside by another vessel.

The comparison now made is to be understood as having relation to existing circumstances, and not at all intended as conclusive in regard to the general merits of iron-clads.

It is in this sense that the action of the Navy Department is to be considered with reference to the selection of one class of vessels over another.

It is evident that it was not designed to adopt any one style exclusively, for of the three vessels first ordered two were of the ordinary broadside class—the Ironsides and the Galena. The latter was quickly proved to be absolutely inefficient, and so must any armored steamer of that size. It is universally admitted that plates of less than four and a half (4½) inches cannot stand the shock of heavy projectiles, and vessels so armored must be of considerable tonnage.

I presume the department only intended to build such vessels as were best adapted to the service at the scene of war.

Keeping in view the peculiar exigencies of the case, which required light draught and great ordnance power, it appears that the selection of the department could not have been more judicious in preferring a number of Monitors to operate from a heavy frigate as a base; and if the intent of the department could have been carried out in regard to numbers, we should now have been in entire possession of the coast from the capes of Virginia to New Orleans, including Wilmington, Charleston, Mobile, &c.

Many defects of both classes are easily remediable, but some of those in the Monitors could only be determined by the test of battle; before that, approximation only was possible.

What other style of vessel could the department have chosen? Certainly none that has been built by English or French naval authorities. The Warrior and her class are exceedingly powerful, but could not get within gunshot here.*

On the other hand, there is very little navigable water on this coast which is not accessible to the Monitors. They command supremely all that is near the shore, and cannot themselves be reached by vessels of heavier draught. So that when there was some reason to apprehend the appearance of certain rams in this quarter, I assured the department that the iron-clads could maintain position so long as coal and provisions lasted.

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* According to Rear-Admiral Paris, the French Gloire draws 28 feet; the British Warrior 26 feet; the Black Prince 23½ feet; even those of inferior class, Defence and Resistance, draw 24 feet. Not one of these vessels could cross the Charleston bar, and would be perfectly impotent to render the least service in any of the operations now being carried on.

It may appear that I speak too positively on the subject, but some experience with them certainly gives a right to do so. With a single exception I have been on board a Monitor in all the principal actions, and the recurrence of casualties to the fleet captains [*] near me shows that I was in a situation to judge. I was once in the Ironsides in an attack on Moultrie and Sumter. I have also watched the behavior of the Monitors at anchor through all the phases of winter weather in this exposed situation.

The completeness with which four little Monitors, supported by an iron-clad frigate, have closed this port, is well worth noting.

Very soon after entering the roads I advanced one Monitor well up towards the inner debouches of the northern channels, supported by another. On the night of the 19th of July an English steamer attempted to run in, and having eluded the hot pursuit of the outside blockade, no doubt indulged in the belief that all danger was past. But the gallant Captain Rodgers was in advance that night with the Catskill, and a shell sent suddenly by him ahead of the culprit steamer signified no escape. In despair or alarm the latter grounded on a shoal, and her wreck has since served as a warning to like evil-doers. Two or three steamers that were in managed to get out immediately after, and one or two may have gotten in, for the crews of the Monitors were often too fatigued then with a day's battle to keep watch at night; but there ended the business as such, and for several months not a vessel has passed in or out.

These four Monitors, who thus keep watch and ward, muster eight (8) guns and three hundred and twenty (320) men, which is almost insignificant in contrast with the work done.

I have thus put on paper the general impressions now uppermost, but very hastily and under great pressure of business, which will, I hope, excuse such imperfections as may have inadvertently occurred.

With more leisure I could do full justice to this interesting subject.

I have the honor to be, very respectfully, your obedient servant,

JNO. A. DAHLGREN,
Rear-Admiral, Commanding S. A. B. Squadron.

Hon. Gideon Welles,
Secretary of the Navy, Washington, D. C.

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[*] Captain George Rodgers was next ahead when killed off Wagner, and his successor, Captain Badger, had his leg broken by an iron splinter in the attack on Sumter.

4

Rear-Admiral Porter's views upon iron-clads.

No. 40.] MISSISSIPPI SQUADRON, FLAG-SHIP BLACK HAWK,
Cairo, February 16, 1864.

SIR: I have the honor to report that I have made a visit to Cincinnati to examine the iron-clads there, and see what prospect there was of getting some of these vessels into immediate service. * * * * * *

It is much to be regretted that the boats at Cincinnati are not finished, as I am certain they would accomplish all that can be done by Monitors. No complaint, however, can be justly made against the contractors for want of activity in the performance of the work on these boats.

When I visited Cincinnati a little over a year ago no preparations were then made to commence these vessels. Now they are in a fair way of being completed, and I think can all be put in the water and ready to operate against an enemy by the first of June.

When the government do get these boats, they may rest assured of receiving as good Monitor-built vessels as have yet been contracted for, for though I have not seen many to which I can compare them, I am glad to say that in workmanship, model, and probably in speed, these vessels will be equal, if not superior, to any Monitors yet built, at least of those that I have seen. I can only draw comparison between these and the first Ericsson Monitor, which I was sent by order of the department to examine. I remember pronouncing that vessel "a perfect success," "and capable of defeating anything that then floated." I was looked upon at that time as something of an enthusiast, as my opinions were widely at variance with those of some scientific gentlemen. The results have justified me in forming a high estimate of the Monitor principle, and I was pleased to see that on our western waters we can build them as well, if not better, than in the workshops of the north. No better proof is wanted of the ability of the west to supply all demands of the government for iron-clad vessels than is given in those building at Cincinnati. The work is perfect in every respect, and put together so well that it may be compared to joiner's work. The hulls are as strong as can possibly be desired, the speed will be good, and the only fault in the vessels, if they have any, is the "overhang" aft, which is of no consequence in a smooth sea, but must be injurious when the Monitors have to go from port to port.

The nearest to completion of these Monitors is one of those in the

Greenwood building; she can be launched in a month, and I am of opinion, when finished, could commence at Cairo, and going down the river, could destroy every vessel we have on these waters, unless they took advantage of their greater speed and ran away. The heaviest and best vessel we have, the Benton, would stand a poor chance against the Monitor alluded to. If she failed to sink the Benton with shot, she could surely do it with her beak or ram, which is not the least formidable thing about her; this is saying a great deal, for the Benton is a very formidable vessel, and since she has been under my command has been struck 130 times in the hull without any apparent damage. Three of the Monitors at Cincinnati are on the improved Ericsson plan, while the two light-draughts building at the Hamilton Works are to be submerged when going into action. I do not like that as well as the Ericsson model, as there is more machinery about them than is desirable; simplicity of arrangement being the object to be aimed at in vessels-of-war. The plan of these latter mentioned vessels is a good one, provided their armor and backing is strong enough to stand heavy shot, which I think will be the case if they only encounter the ordinary rifle projectile.

From the information received from the different officers I have sent on duty at various times to the points where these iron vessels are building, the same favorable report is made of their efficiency, and the good work that is being put on them; and in six months we will have a fleet of vessels that will keep this river against the fleets of the world, and be enabled to carry the war into the enemy's quarters where there is anything like an equality in guns. I think too much has been expected of Monitors heretofore, and the fact that two or three of them were not able to overcome obstacles formidable enough to keep out a large fleet of three-deckers has, in a measure, weakened the confidence of the public (who generally know little or nothing about such matters) in them.

But the Monitors, for harbor defence, are just as valuable as they were on the day when the first one drove the leviathan "Merrimack" back to her hole, and saved the honor of the nation. I am sure that Monitors would have done much better on this river than the old Pook gunboats did, which were built for temporary purposes only, or until Monitors could take their places. Earthworks on elevated positions are difficult to silence, it is true, except by a concentrated fire of many guns, and Monitors are not well provided in numbers. No vessels have been more successful than the Mississippi gunboats whenever they have been called on to attack such works. Still they were very deficient in one respect, as they were very vulnerable, suffered a good deal, and proved that in the end the Monitor principle, from its invulnerability, was the only thing that could be safely depended on. For this reason I often wished that I had been provided with *one* good Monitor, with which, at certain times, I could have accomplished more than with a fleet of such boats as we have here.

A new boat, the Ozark, has just arrived here. As far as her turret is concerned she is all right, but her hull is too high out of water, and she lacks speed; she can only be considered one of the temporary vessels, and will be valuable only under an ordinary fort.

The two light-draught Monitors, Osage and Neosho, do very well for light work, but are not at all suitable for rough weather or heavy service; and I would not recommend the building of any more vessels of this kind. A more uncomfortable class of vessels it is not possible to think of; they are perfectly killing to officers and men. The work on them is not as good as that done at Cincinnati and Pittsburg, but it is quite creditable for first attempts.

If it is the intention of the government to build any more Monitors, or, indeed, iron-vessels of peculiar construction, I would beg leave to recommend that a fair portion of patronage be given to the western foundries. I believe the work will be done cheaper and better than it can be done elsewhere. Vessels of any size can be built in any part of these rivers. The senseless cry about the want of water, here or there, should not be taken into consideration for a moment, for at low water the whole Mississippi is a chain of sand bars, and no place then possesses any advantage over another. There is less water below Cairo than there is at Cairo and neighborhood, and at dead low water a boat drawing six feet cannot get above Helena, while, for eight months in the year, a vessel drawing ten feet could traverse nearly the whole length of the river. It matters little, then, what point on the river is occupied as a building point; proper encouragement on the part of the government would cause workshops to spring up in all directions, and government would have vessels built by private enterprise cheaper than could be built at government works out here, which in this region would cost large outlays before they would be ready to build a steamer.

It is astonishing how little these western manufacturers require to commence operations with; and while the government officials would be laying out the yard to work in, they would have the vessel built.

I do not know that any useful information can be gained by a history of the iron-clads used on this river, for I presume and hope that there is no intention of building any more vessels of that class; they were temporary expedients, and they have done their work well. I do not think it desirable, however, that any more should be built. No vessels have done harder fighting anywhere; they have averaged twenty-one hours each under fire since they were first built and put in commission. Some of them have been sunk and others badly cut up, but they have seldom failed to achieve their object, and have opened, or helped to open, over 3,600 miles of river once in the hands of the enemy. Had they been Monitors, they would have accomplished their work in much less time, as there was never sufficient confidence in their ability to stand shot, except when opposed to a fort bow on, in which case I know of no failure on their part to silence a battery, though they could not always take possession. Had they been Monitors, many things would have been undertaken that were deemed too hazardous in semi-wooden vessels, and many forts would have been captured or attacked successfully that were deemed impregnable against anything but Monitors. I can say, however, that no backwardness was ever shown by the commanders of the temporary gunboats in attacking any fort that was erected on the river with more or less success; and the reason why more casualties did not occur on board the vessels was owing to their fighting bow on, and presenting their strongest part. These vessels have a wood backing on their bow of twenty-four inches of oak, which is covered with three inches of iron. I know of no instance where the iron on the bow was perforated. Some of the plates were cracked and badly indented, but were always serviceable afterwards, and it was seldom thought necessary to repair them.

In connexion with this matter, I beg leave to say that from my observation the resistance of iron depends more on the wooden backing than on the thickness of the iron—that is, two inches of iron on thirty-six inches of oak will resist more than three inches of iron on fifteen inches of oak. I have, moreover, noticed that where there is a backing of wood covered with three-inch iron, and *that* iron with wood again, the resistance of the latter will prevent balls of heavy size from entering the iron. In fact, it is hardly indented. This was particularly demonstrated in the passage of the fleet past Vicksburg, when it was necessary to take every precaution to insure success and prevent injury to the steamers. Heavy logs, twenty inches in diameter, were hung perpendicularly on the sides of the vessel close together, and so secured that no shot could strike the side without passing through the logs. Bales of hay were also packed over the decks and sterns in sufficient thickness (it was supposed) to prevent the passage of any shot. Suffice it to say, the pressed hay was no protection whatever against shot or shell. They passed through four or five bales, and very much endangered the vessels by setting the hay on fire. Wherever the projectiles of the enemy struck the logs, they did no further damage; they would pass through the logs, strike the iron without leaving more than an indentation, and glance off. Many instances of narrow escapes could be mentioned where the vessels were saved by the intervention of the wood, and in no instance were the vessels damaged where the logs were properly placed. The incidents of that night—the passage of the Vicksburg batteries—suggested to me the idea of first having a heavy backing of wood, then a layer of iron, and then a covering of wood over the iron, which will, I am convinced, make a vessel perfectly shot-proof. I notice that the idea is not an original one, but has been discovered and recommended by several persons. There are two vessels in this squadron, the Lafayette and Choctaw, which give proof of the value of heavy backing to iron. These vessels were built with heavy frames, covered on the outside with gutta-percha, and then with a light thickness of iron. Whenever these vessels have been struck on the iron where the wood backing was heavy, they resisted the shot of heaviest calibre, but where the backing was light shot went in at one side and out at the other. The defence of gutta-percha was not of the slightest use; on the contrary, it was a detriment, and aided very much in destroying the vessels by rot. It is so much extra weight that the vessels have to carry, without deriving the slightest benefit from it. The money that built the Lafayette and Choctaw would have built three Monitors of such a model; that one Monitor would have destroyed both of the first. I would here state that these two vessels will only be serviceable for a short time, as they are already showing signs of weakness. They are not very serviceable, have not speed enough, and are too unwieldy for rams, and in some parts are very vulnerable. They have, however, fine machinery, and when they wear out it can be fitted to better hulls. I consider these vessels only as temporary expedients, to give way to the Monitor class when there is a sufficient number built.

Another class of vessels in this squadron deserves mention, as showing the different expedients resorted to to open and defend the Mississippi river. I allude to the Tuscumbia, Chillicothe, and Indianola. Two of these have been tried under batteries, and the Indianola in battle against vessels, and have shown that the Monitor principle only was the right one. Their turrets were in no instance found impenetrable to the heavy rifled shot, and besides they were soon damaged in their wheels, which afforded fine targets for the enemy to fire at. Still, two of these vessels remained under fire as long as any Monitors have been known to remain at one time, and if they did not come up to the Monitors in invulnerability, they accomplished all that was required at the time, viz: the capture of the enemy's stronghold. The builders never claimed that they should be considered more than *temporary* expedients with which to harass the enemy; and taken in that sense, they certainly may be considered very good vessels, and have fairly repaid all the money spent on them, taking into consideration the work they have done.

As to approving of any of the above-mentioned styles of gunboat as part of a permanent system of national defence to be adopted in this country, that I cannot do. Any professional man who will lay aside his prejudices caused by the discomforts incident to the Monitors, must admit that as a harbor defence they are the best and only vessels to be built; and I hope we shall see every harbor in the United States where there is a chance of an enemy penetrating, supplied with two or three of these floating batteries. If they have not been able to penetrate the harbor of Charleston, where fifty guns to one was opposed to them, and where they had to contend with obstructions placed in their way impossible to be removed, it in no way detracts from their well-earned reputation for efficiency. They have done at Charleston what no other vessels ever built *could possibly have accomplished;* and though the army, as usual when combined operations are carried on, has monopolized all the honors, it is a very certain fact that the Monitors held their own as no other vessels could have done, and under their shelter the army was enabled to perform their work successfully.

I hope, sir, you will excuse the unreasonable length of this communication on the subject of the Monitors; but I know their value when properly used, have felt the want of them so much at times that I would have exchanged several even of the best of my vessels for one of them properly fitted. I have seen a whole army kept at bay for the want of one of these little "shot-proofs," and have, now and then, been tempted to do foolish things in hopes of accomplishing what I deemed impracticable. The Cincinnati was sunk when my own judgment told me it was wrong to place her where I was called upon to order her to. With a single Monitor results would have been very different; and on that day, instead of having a vessel sunk, the right wing of our army would have gained a position commanding the most important works in and about Vicksburg. Vulnerable as this vessel was, it would not have done for the navy to hesitate, when the *army thought there was a prospect of success.*

In conclusion, sir, permit me to express the hope that the west may be converted into a large workshop for the building of future Monitors of all sizes. I know of no part of the Union where the work can be done better or quicker.

I have the honor to be, sir, very respectfully, your obedient servant,

DAVID D. PORTER,
Rear-Admiral.

Hon. Gideon Welles,
Secretary of the Navy, Washington, D. C.

5

Commodore John Rodgers's opinion of iron-clads.

WASHINGTON, D. C., *April* 7, 1864.

SIR: I have the honor to reply to your letter in regard to armored vessels. There are two classes of iron-clad vessels-of-war in use, in which two different principles are involved; these classes have each their peculiar defects and advantages. I refer to the Ironsides class and to the Monitor class.

In the Ironsides class the hull of a wooden man-of-war, as constructed for general purposes, is clad with iron. It is true some modification of shape and increase of size is required to meet the additional weight which she has to carry, but still, in essentials, she is a vessel of the ordinary model; she has the advantages of ample quarters for her crew, with free access to her decks in storms, with natural ventilation, with abundance of light, with numerous guns, giving her a rapidity of fire unattainable in a Monitor, and essential in battering forts; and she is as able to carry canvas as other men-of-war.

The Monitor class, as far as I know, is new. If I understand the idea, it is to cut off all the surface above water, except that which may be necessary to flotation, and to carry the guns in a revolving turret, or turrets, near the centre of motion, and supported upon the keel and kelsons.

The plans upon which Mr. Ericsson has worked out this idea of his may be modified by further experience, but the idea itself will be employed while iron-clad vessels are used in warfare.

It has these advantages: The Monitor has the least possible surface to be plated, and, therefore, takes the least possible tonnage to float armor of a given thickness, or with a given tonnage allows the greatest possible thickness of armor, and consequently the greatest possible impenetrability. The ability to carry armor is proportionate to the tonnage; but the Monitors of 844 tons have actually thicker plating than the Ironsides of 3,480 tons, and than the Warrior of 6,000 tons, and yet the Ironsides and Warrior have only the middle portion of their hulls plated, their ends being merely of wood without armor.

The guns of the Monitors, near the centre of motion, are supported upon the keel and kelsons, upborne by the depth of water under them, and carried by the whole strength of the hull. In Monitors heavier guns are therefore practicable than can ever be carried in broadside out upon the ribs of a ship.

In Monitors, concentration of guns and armor is the object sought. In them the plating is compressed into inches of elevation, while in the Ironsides class it is extended over feet, and the comparatively numerous guns distributed over the decks of the Ironsides class are moulded into a few larger ones in the turrets of the Monitors.

When power is required in the individual guns, enough to crush and pierce the side of the adversary at a single blow, the most formidable artillery must be employed, and fifteen-inch guns are the most formidable which, so far, we have tried; but no vessel of the Ironsides class can carry these guns, and the Monitors actually do carry them.

If target experiments are reliable, a shot from the fifteen-inch gun will crush in the sides of any vessel of the Ironsides class in Europe or America. A single well-planted blow would sink either the Warrior, Gloire, Magenta, Minotaur, or Bellerophon.

The Dictator, of 3,000 tons, has armor thick enough, I believe, to withstand fifteen-inch guns.

The objections to the Monitor class, such as I have seen in use, are from fewness of guns; the lack of rapidity of fire in battering forts or wooden vessels; the loss of accommodation from dispensing with the upper deck or decks; the greater unhealthiness from dampness and from confinement below, in even a moderate sea; from the loss of light; and from depending upon blowers driven by steam for ventilation.

The Monitors are slower than their steam power would seem to promise. In all of them the slip of their screws is excessive. This I attribute to the overhang, which, if a source of strength in action from its use as a ram, and from its protecting the propeller and rudder, is a source of weakness and strain at sea. The overhang has the advantage of keeping the vessel very steady. She cannot roll with these wing-like projections holding up her sides, nor pitch, nor send with the immense flat surface of the overhang to resist those motions; but as the Monitor is slower than other vessels of like tonnage and power, it must be presumed that the difference of shape makes the difference of speed; and the overhang constitutes the sole difference of shape.

If ordinary vessels can endure the pitching and rending motions, it may be inferred that the Monitors can endure them. If ordinary vessels can have their rams below water, so may the Monitors; nor is it necessary to equality that the rudder and propeller of the Monitor should be better protected than those of her competitors.

The Monitor model rolls very little, and is extremely easy in a seaway. In a gale of wind it was found on board the Monitor Weehawken that while her companion, the wooden corvette Iroquois, (deemed a very perfect model,) had an excessively violent motion, so violent indeed that no one could stand upon her decks without the assistance of life-lines, the Weehawken had so little motion that a bottle of claret stood for an hour upon its narrow base on the dinner-table in the cabin, when it was put away.

I do not consider the lowness of the Monitors in the water a source of unsafeness. They start to sea with sufficient buoyancy, and, by the consumption of coal and provisions, they hourly grow lighter. Anything lighter than water will float upon it, and however deeply buried, while lighter than water, it must come to the surface; but effectual means must be used to keep the vessel tight, for any considerable accumulation of water in the hull will sink her, which is true also of ships generally.

The casemated vessels, such as the Ironsides, if not safer than Monitors, are more comfortable, and, therefore, probably more healthy, with greater facilities for carrying canvas than the Monitor class seems to admit of.

To sum up my conclusions, I think that the Monitor class and the Ironsides class are different weapons, each having its peculiar advantages; both needed to an iron-clad navy, both needed in war; but that when the Monitor class measures its strength against the Ironsides class, then, with vessels of equal size, the Monitor class will overpower the Ironsides class, and, indeed, a single Monitor will capture many casemated vessels of no greater individual size or speed; and as vessels find their natural antagonists in vessels, and only their exceptional antagonists in forts, it must be considered that, upon the whole, the Monitor principle contains the most successful elements for plating vessels for war purposes.

I have the honor to be, very respectfully, your obedient servant,

JOHN RODGERS,
Commodore United States Navy.

Hon. GIDEON WELLES,
Secretary of the Navy.

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SOLEY, J. RUSSELL: "The Blockade and the Cruisers"

Periodicals

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